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The Biological Status of Lichens.

By Albert Schneider.

For reasons to be enumerated, our present knowledge of lichens is very imperfect. Lack of attention is not the cause, as the voluminous literature on the subject will testify. The references, authentic and otherwise, number many thousands. It would be an endless task to bring together all the monographs, treatises, and especially the "fragments," referring to lichens. Lichenologists of ante-Schwendenerian time supposed that the question of the true nature of lichens and their position in the vegetable kingdom was permanently settled. Nothing was left for them to do but to issue "fragments" describing presumably new species and varieties. Collectors set to work in widely distributed and circumscribed areas to add their mite to the heap of confusion. We all know that the ultimate aim of science is to systematize; but no system can be formed from unknown material, whatever it may be. A scientist's first duty then is to study (*as far as possible*) his material before attempting to classify it. This careful studying of material is what the *mass* of lichenologists have heretofore failed to do. It is not my intention to enter into a historical review of lichenology, as that has already been thoroughly done by Krempelhuber and others. With the above introduction I shall now attempt to make somewhat clearer the present status of general lichenology.

The epoch-making researches of de Bary, Schwendener, Bornet and others have conclusively demonstrated the dual nature of the lichen structure; that is, it consists of a colorless hyphal portion homologous with certain filamentous fungi; and a green celled portion homologous with certain low forms of algae. The specific algal homologues have been pretty accurately studied out. Concerning the specific homologues of the fungal portion our knowledge is less accurate. But in regard to both symbionts we are certain of their originally independent ancestral forms. This theory of Bornet and Schwendener has from the very first met with strong opposition from nearly all lichenologists (taxonomists, so called). Even a considerable number of physiologists and morphologists misconstrued evident facts with unscientific perversity, notably Itzigsohn, Famintzin and Baranetzky. Even to this very day there are a number of lichenographers who persist in ignoring or directly opposing Schwendener's theory. This is simply additional evidence of the correctness of the statement "None are so blind as those who do not wish to see."

It would be useless to repeat the arguments based upon actual experimentation which conclusively prove the correctness of Schwendener's theory. There is, however, a question which Schwendener and his immediate followers have almost unanimously answered wrongly and that is the question of the true position of lichens in the vegetable kingdom. During the ante-Schwendenerian time, beginning with the earliest periods, most lichenologists looked upon lichens as autonomous structures, though this conclusion had no scientific basis founded on morphology and physiology. Their characteristic distribution and marked macroscopic appearance were thought sufficient to make them a distinct group. Schwendener assumed that lichens resembled certain groups of fungi, both in structure and in their manner of growth, and should therefore be classed under fungi as ascolichenes and basidiolichenes. It is much to be regretted that Schwendener did not see his mistake in time to avoid confusion and unnecessary and unwarranted opposition to his theory. I will frankly admit that I formerly thought it most expedient to classify lichens as modified fungi. But having since made a special study of lichen morphology, I now consider such a pro-

cedure both unscientific and impracticable. This idea is not original with me, nor do I stand as its only advocate. Many of the most recent scientific writers, notably Reinke, strongly uphold this view. I shall briefly consider lichens from the standpoints of morphology and physiology to show that they can only be treated as *autonomous structures having a phylogeny of their own.* I shall not consider it worth while to enter into word quibbling as to the meaning of "autonomy." If such were my desire I might well deduce good arguments to show that angiosperms are not autonomons, that they are simply modified gymnosperms, that gymnosperms are modified pteridophytes, pteridophytes modified mosses, etc., finally having it reduced to a primal cell; this cell could still be reduced to organic matter, and that to inorganic matter, etc. I shall consider as autonomous any comprehensive group of organisms having morphological and physiological characteristics differing from those of any other comprehensive group of organisms; meaning by comprehensive group any collection of allied individuals comprising natural species, genera and families. I will first show why lichens cannot be classed as fungi.

The method of reproduction in lichens is wholly different from that of fungi. It is true that lichen spores have a strong morphological resemblance to those of their probable homologues among the fungi. Functionally they differ widely. They cannot be considered specific reproductive organs of lichens as they formerly were of fungi, because they are not capable of developing into a complete mature lichen or even a fungus. They will indeed develop a mycelial network which will however not produce spores unless associated with its symbiotic alga. They can only be looked upon as *degenerate reproductive organs of their fungal ancestors.* This degeneracy is the more marked as we ascend the scale of lichen development. Taking one of the lower types, as exemplified in *Pyrenula*, we find spore organs having almost typical, fungal characters; that is, apothecia are prominent, paraphyses distinct and numerous, spore wall rather thick and colored, spores distinctly septate. These are the usual characters of fungal spore organs. Considering some of the higher types as exemplified in *Parmelia* and *Cladonia*, we find apothecia few or wholly wanting; when apothecia are present the asci are few in number, spore wall

comparatively delicate and colorless, spores non-septate. There is no doubt that lichen spores still play a *part* in lichen reproduction. *This can however only take place when the spore with the specific algal symbionts are placed in a suitable environment.* That is, spores and algae must fall upon a spot where the algae can maintain existence independently until such time as the spores shall develop a mycelial network with haustoria with which to surround the algae, thus forming the beginning of a new lichen thallus. Should, for example, the spores with the requisite algae fall upon a dry rock the algae would die, and if the spores should subsequently develop there would be no algae with which to form a lichen. From this it is evident that lichen spores must be very unreliable as *assistants* in lichen reproduction. From the very nature of things, lichen spores are not true reproductive organs of lichens, hence their tendency to degenerate.

The question whether lichen spores are sexual or asexual products is still unsettled. The observations of Stahl in the case of *Collema microphyllum* have not yet been verified. If his observations prove to be correct, then we may assume that lichen spores are sexual products. I am, however, strongly inclined to believe that Stahl's observations were probably erroneous. From numerous examinations of so-called "spermagonia," I believe them to be parasitic fungi, of which the "spermatia" are the spores. From a rather hasty comparative study it seems probable that their homologues are to be found in *Septoria* or allied genera. For example, *Septoria Speculariae* presents the general morphological appearance of spermagonia. The fact that we readily recognize *Septoria* as parasitic fungi lies only in the nature of things. In case of *Septoria* the morphological and physiological contrast between host and parasite is great, while in the case of spermagonia this contrast is only slight. No one would ever think of recognizing *Septoria Speculariae* as the male reproductive organs of *Specularia perfoliata*, upon which it lives. Such a suggestion would certainly be highly ridiculous. Then why should spermagonia of lichens be recognized as male reproductive organs, especially since no one has demonstrated that they play such a function? According to Wiesner, spermatia do develop a mycelium which finally produces spermagonia. From this the true nature

of spermagonia may safely be conjectured. To say the least, it is certainly unreasonable to assume that spermatia will at one time function as non-sexual spores, and at another time as male sexual organs. Further investigations will reveal the true nature of things. The sooner this is accomplished the better, as many lichenologists have already made the deplorable mistake of considering spermagonia as important characters in lichen classification. To classify plants according to the characteristics of the parasites found upon them would certainly be a questionable procedure in modern taxonomy.

Other characteristics which distinguish lichens from fungi are the presence of various chemical compounds, notably lichenin, which is never found in fungi.

Characteristics which distinguish lichens from fungi also distinguish them from algae. There is certainly less similarity between an alga and a lichen than there is between a fungus and a lichen, though several attempts had been made to classify them as algae. In general it may be stated that lichens *resemble* algae only in so far as the algal symbiont resembles algae. The *differences* will be brought out in the discussion of those characters which separate lichens from both algae and fungi. For convenience sake I will separate these characters into morphological and physiological. These are the characters which fully establish the autonomy of lichens.

Morphological.

Lichens, macroscopically considered, have such a peculiar appearance that the most superficial observer is naturally led to suppose that they form a group by themselves. They are found in places where neither alga nor fungus can exist alone. Especially peculiar is their ability to resist low temperatures. Freezing only checks their growth. A temperature of —40 ° C. does not kill them. Such crude observations are however not sufficient to establish their individualism.

The lichen thallus is of special interest to the morphologist since this structure is typically lichenological. It always consists of the hyphal and algal symbionts. The algal symbiont is usually more centrally located, being surrounded by the hyphae of the

fungal symbiont. Three types of lichen thallus may be recognized, namely, the crustaceous, the foliaceous and the fruticulose. The crustaceous type is the most rudimentary and cannot be said to to have even a dorsiventral structure, though one would naturally expect this from the nature of things. The lower surface differs only in having more numerous extended hyphal filaments to enable it to adhere more firmly to the substratum as well as to take up soluble food materials. The second type already indicates a considerable advance in the evolution of the lichen thallus. It is typically dorsiventral. Dorsal and ventral layers are semi-cortical in structure; that is, the hyphal cells are closely united and have only few air passages. Between these two layers is a layer of loosely interwoven hyphal tissue in which are imbedded the algae. From the lower surface extend the rhizoids. On the upper are found the apothecia (with exceptions, example, *Nephromium*) and soredia, besides the so-called "spermagonia" and occasionally accidental fungal and algal parasites. The third type (as exemplified by the vertical thallus of *Cladonia* and *Thamnolia*) shows a typical radial structure. Numerous examples showing the gradual gradation from the dorsiventral to the radial type can be found. In the radial type there is an outer semi-cortical layer, which usually differs from that of the dorsiventral cortical layer in that it is more compact. The fungal cell walls have become somewhat gelatinized and adhere very closely. Next to this layer, on the inside, is the layer of loosely interwoven hyphae containing the algae. The third and innermost layer consists of longitudinal closely united hyphae. Sometimes this thallus is hollow in the center, sometimes solid, containing a central core of closely united longitudinal hyphae.

Soredia are also typical lichen structures. They are very numerous in the higher forms of lichens (example, *Parmelia sorediata*), and are found on the dorsal surface of the thallus, more frequently near the margin. Each soredium is in reality a miniature thallus. It is usually spherical in form, the outer layer consisting of closely united hyphal cells; the central portion consists of algal cells and loosely interwoven hyphal filaments. Soredia contain all the elements necessary for the development of a new lichen.

From what has been stated above, apothecia can not be looked

upon as typical lichen structures, yet their morphology is of great importance in the consideration of lichen evolution and classification. Some of the changes in apothecia indicating a probable higher or lower stage of development have already been referred to. As I intend to consider these changes more particularly in a future paper on lichen classification, I shall at present omit further discussions. I shall now briefly consider the physiological characters which distinguish lichens from both fungi and algae.

Physiological.

In their method of growth lichens stand alone. The two symbionts form a microcosmos which is enabled to perform the necessary life functions which were originally inherent in both, and in addition they have acquired new characteristics during their phylogeny as lichens, which unmistakably stamp them as autonomous structures. As a unit they can now exist where neither symbiont could exist alone. In spite of this intimate mutualism, it is not at all likely that the fungal symbiont is *wholly* dependent upon the algal symbiont for its food supply. For example, a lichen spore may develop to a considerable extent as a saprophyte upon decaying wood, humus, and other dead organic matter; nor is it at all likely that a lichen can develop upon purely inorganic matter, as, for example, pure quartz crystals. Of course, the spore, with the requisite algae or a soredium, has bound up within itself a certain amount of extra food material, which enables development to begin in the absence of all organic matter. The mycelial network then forms a structure for collecting within its meshes organic substances, carried to it by air and water currents; this allows growth to continue. No amount of food supply will, however, allow the fungal symbiont to mature without its algal symbiont, excepting perhaps the lowest forms. Thus we see that mutualism of fungus and alga is necessary to form a lichen. The fungal symbiont, considered by itself, still retains its ancestral function as a saprophyte; in addition it has acquired the habits of a semi-obligative parasite upon its algal symbiont. The algal symbiont, which has the function of chlorophyll-bearing plants in general, that of assimilating carbon, must be looked upon as a facultative parasite, since it can exist and mature independently of

its fungal symbiont. This has been repeatedly demonstrated experimentally. Considered as a unit, the fungal portion of the lichen supplies the algal with water, the necessary mineral substances, N., O. and H., from the underlying substratum and air. The algal symbiont as a result of this unusual supply of food materials, forms an extra amount of carbon and nitrogenous compounds, which is assimilated by the fungal symbiont. Thus it is seen that the benefit derived from this association is mutual. The term "mutualism," proposed by Tubeuf, is very appropriate and may well supplant the equally correct but more complex expression "mutualistic symbiosis," proposed by Frank.

Reproduction by means of soredia stands without a parallel in the vegetable kingdom. They are of course asexual, and are formed in the algal zone of the lichen thallus by the symbiotic association of algae and hyphae. They may be designated as mutualistic brood buds. They are really vegetative reproductive organs, and on that account the objection may be raised that they are not true reproductive organs. I shall not here enter into a discussion on the ultimate difinition of reproductive organs. The fact remains that *soredia alone contain the necessary elements for forming a new lichen.* There is no doubt that the great majority of lichens are reproduced from soredia; in fact, this is the only means of reproduction in some species. The outer semi-cortical hyphal layer of soredia enclosing the algae maintains a sufficient degree of moisture to enable them to lie dormant for a long period of time, or until conditions are suitable for their development. They are certainly far more reliable than spores (associated with the necessary algae) as reproductive organs. In fact, as Reinke has indicated, lichen reproduction by the aid of spores is in most respects similar to reproduction by means of soredia. In *Endocarpon pusillum*, for example, some of the algae are ejected and with the spore adhere to the mucilaginous spore wall, thus forming a sort of soredium in which the spore represents the fungal element. If the algae are not ejected with the spores, the chances for developing a new lichen must indeed be slight, for reasons already given.

In my opinion sufficient reasons have been given why lichens cannot be classed with fungi, much less with algae, and must

therefore be considered as an independent group. Based upon morphological and physiological considerations this group would naturally belong midway between fungi and algae.

In conclusion I shall offer a few suggestions on the probable origin and phylogeny of lichens. There is little doubt that various subdivisions of lichens indicate a polyphyletic origin. Of this polyphylogeny either one or all of several forms may have occurred. For example, in ascolichenes, a certain fungal type may have (during its phylogenyas a lichen symbiont) become so modified by its symbiosis with a given algal type, as to enable it to associate with other algal species; or it may be that the same algal type became adapted to one or even several fungal types. As to what the conditions actually were we are at present scarcely able to say. Of one thing we are, however, certain and that is that a lichen is the result of the mutualistic association of a fungal and an algal type. Though in general I agree with Reinke as to the origin of lichens, yet I am not so ready to assume (theoretically) that *Collema* represents the oldest lichen type. *Collema* is the result of the symbiotic association of the alga *Nostoc* with some fungus whose ancestral type is not definitely known. The mass of the lichen structure consists of the alga. As compared with some other lichens the following are some of the reasons why *Collema* does not represent the lichen prototype: 1. The alga has undergone considerable change by way of adapting itself to new environments. Originally it was no doubt accustomed to a high degree of moisture (as is its present homologue, *Nostoc commune*), while in its present form as a lichen it is able to exist on tree trunks, rocks, etc., as most other lichens. 2. Its thallus shows a considerable degree of differentiation, as exemplified in the closely allied genera *Hydrothyrio*, *Polychidium*, *Leptogium* and *Mallotium*. 3. Spores have probably become considerably degenerated as indicated by their thin colorless walls, and in many cases indistinct septae. As a rule apothecia are few, though there are exceptions to this. 4. Soredia, though not numerous, are more frequently present than in many other lichen forms.

The above are the main reasons why Collema is perhaps not the prototype of lichens. In my opinion the true prototype of lichens is perhaps to be found in those structures which were for-

merly recognized as pseudo-lichenes. They may be observed on nearly every tree trunk, on fences, rocks, pavements, etc.; in fact, anywhere where the lower forms of algae (especially *Protococcus viridis*) can exist. Examination of these algae will find them usually associated with fungal hyphae, sometimes forming extended thin thallus-like layers. The structure formerly recognized as *Lepra viridis* is an excellent example. Though apothecia are never found, yet I am inclined to believe that in so-called *Lepra* we find the beginnings of a future lichen. At least there are many lichens which show an inferior structure as compared with *Collema*, and for that reason are perhaps nearer the prototype. As an example we may mention *Pyrenula*. *Verrucaria* perhaps represents a degenerate type rather than a lower type of an ascending series, as is indicated by a rudimentary thalline structure associated with rudimentary or degenerate apothecia, spores and paraphyses. Whether a given lichen represents a low type of an ascending series or a degenerate higher form is in many cases difficult to decide; also the question as to the relative phylogenetic ages of various lichen groups. There is perhaps little doubt that basidiolichenes have had a much shorter phylogenetic history than ascolichenes. There are many problems in lichenology which must be left to the conscientious morphologists and physiologists to solve. In fact, we know so little of the life history of individual lichens that the time for final specific arrangement has not yet come. We, however, know sufficient of lichens as a whole to give them a proper position in the vegetable kingdom which is in reality the first step toward establishing a lichen system. Their proper position I have attempted to indicate in this paper.

New Species of Fungi.

By Chas. H. Peck.

Lepiota fulvodisca. Pileus thin, convex or nearly plane, obtuse or umbonate, viscid when moist, white, with the disk or umbo fulvous or tawny-brown; lamellae narrow, close, free, white; stem slender, flexuous, viscid, hollow, white or whitish, the base abruptly bulbous, the annulus thin, membranous, pure white; spores ovate-elliptical, .0003 to .0004 in. long, .00016 to .0002 in. broad, usu-

ally containing a shining nucleus and furnished with a slight apiculus at one end.

Pileus 1 to 1.5 in. broad; stem 2 to 3 in. long, 1 to 1.5 line thick.

Plant fragile, growing among fallen leaves in woods. Pasadena, California. January. Prof. A. J. McClatchie.

From *L. illinita* Fr. this species is separated by its tawny disk of the pileus, its membranous annulus, the bulbous base of the stem and the different shape of the spores.

CLITOCYBE PUSILLA. Pileus at first hemispherical or convex, then nearly plane, obtuse, sometimes with a very small umbo, dry, pruinose, grayish, flesh thin, whitish; lamellae narrow, close, adnate or decurrent, white; stem short, solid, pruinose, grayish; spores subglobose or very broadly elliptical, .00016 to .0002 in. long.

Pileus 3 to 8 lines broad; stem about 6 lines long, scarcely 1 line thick.

Densely gregarious or subcaespitose. On manure. Pasadena. February. McClatchie.

Apparently belonging to the tribe Disciformes and related to *C. Bresadolae* Schulz, but an exceedingly small plant for that tribe.

COLLYBIA ALBOGRISEA. Pileus fleshy, thin, convex or nearly plane, often somewhat irregular on the margin, glabrous, whitish or grayish, flesh white; lamellae broad, distant, adnate, white or whitish, the interspaces often venose; stem nearly equal, hollow, sometimes twisted, whitish or grayish, the lower part covered with a dense whitish, grayish or yellowish tomentum, the upper part naked or merely white-pruinose; spores broadly elliptical, .0002 to .00024 in. long, .00016 broad, generally containing a single shining nucleus.

Pileus about 1 in. broad; stem 1.5 to 2 in. long, 1 to 2 lines thick.

Plant often caespitose and then the pileus irregular from mutual pressure. Among fallen leaves. Pasadena. January. McClatchie.

The species belongs to the tribe Vestipedes.

MYCENA ELEGANTULA. Pileus membranous, conical or campanulate, sulcate-striate, brown or purplish-brown; lamellae distant, adnate with a decurrent tooth, whitish or pallid with the edge purplish-brown, the interspaces (in the dried specimens) venose or transversely wrinkled; stem slender, hollow, glabrous, sometimes

with a loose grayish fibrillose tomentum at the base; spores oblong-elliptical, .00035 to .0005 in. long, .00016 to .0002 broad, usually containing one or two small nuclei.

Pileus, 4 to 10 lines broad; stem 1 to 2 in. long, .5 a line thick.

Gregarious or caespitose. Among fallen leaves under trees. Pasadena. December. McClatchie.

This plant may be distinguished from the closely related *M. atromarginata* Fr. by its smaller size and the purplish tint to the edge of the lamellae, and from *M. purpureofusca* Pk. by its differently shaped, longer spores.

OMPHALIA SEMIVESTIPES. Pileus very thin, deeply convex or subcampanulate, glabrous, grayish-brown in the dried state, paler when fresh; lamellae rather broad, distant, arcuate, decurrent, white or whitish; stem hollow, white or whitish, the upper half glabrous, the lower half clothed with a white mycelioid tomentum; spores elliptical, .0002 to .00024 in. long, .00012 to .00016 broad.

Pileus 6 to 12 lines broad; stem about 1 in. long, 1 to 2 lines thick.

Growing on much decayed wood. Newfoundland. May. Rev. A. C. Waghorne.

This plant is apparently related to such species as *O. setipes* Fr. and *O. grisea* Fr. and belongs to the tribe Mycenariae. It is easily recognized by the peculiar character of the stem. In the dried examples the upper glabrous part of the stem is shriveled and longitudinally striate, but the lower tomentose part is plump and even as in the fresh plant.

HYGROPHORUS ELEGANTULUS. Pileus convex or nearly plane, glabrous, viscid, grayish-yellow or slightly tawny, flesh white; lamellae distant, slightly decurrent, white; stem equal, solid, slightly floccose-squamulose at the top, elsewhere glabrous, glutinous, white or whitish, sometimes abruptly pointed at the base; spores elliptical, .0004 in. long, .0002 to .00024 broad.

Pileus 1 to 2 in. broad; stem 2 to 3 in. long, 3 to 4 lines thick.

Woods. Maryland. November. T. Taylor.

The species belongs to the tribe Limacium, and is related to *H. discoideus* Fr., from which it may be separated by its solid stem and larger spores.

ENTOLOMA FERRUGINANS. Pileus fleshy, convex, obtuse or umbonate, often irregular, hygrophanous, glabrous, shining, dark fuliginous or broccoli-brown, flesh whitish, fibrous and colored at

the surface; lamellae 4 to 7 lines broad, adnexed, easily splitting transversely, grayish-salmon, becoming clay-color; stem solid, glabrous, yellowish or cream-color, blunt at the base or sometimes attenuated and radicating; spores subglobose, irregular or angular, .0003 to .0004 in. long.

Pileus 2 to 6 in. broad; stems 3 to 4 in. long, 4 to 8 lines or more in thickness.

Under oak trees. Pasadena. February. McClatchie.

This plant is related to *E. rhodopolium*, but is separated from it by its darker color and solid stem. According to Prof. McClatchie, the fresh plants have a strong odor resembling that of ferric chloride, and chemical tests showed the presence of iron. It is pronounced edible by him.

LEPTONIA EDULIS. Pileus thin, convex or centrally depressed, with or without an umbo, velvety, dark-gray; lamellae rather broad, subventricose, adnexed; moderately close, at first whitish or light drab, becoming flesh-color; stem slender, hollow, colored like the pileus, often with an abundant white mycelioid tomentum at the base; spores subglobose, angular, apiculate at one end, .0003 to .0004 in. long, containing a single large nucleus.

Pileus 6 to 18 lines broad; stem 12 to 18 lines long, .5 to 1 line thick.

Among grass and weeds. Pasadena. January.

According to Prof. McClatchie, this plant when fresh has a nutty flavor and is edible. The velvety appearance of the pileus has disappeared from the dried specimens. In some, the margin of the pileus is striate, but in the fresh plant the margin is said to be even.

ECCILIA NIGRICANS. Pileus thin, convex, umbilicate or centrally depressed, subzonate, unpolished, grayish-black; lamellae broad, distant, decurrent, light-drab or brownish, becoming tinged with flesh-color; stem short, hollow, grayish-black, commonly with an abundant white mycelium; spores angular, .0004 in. long, nearly as broad, containing a single large nucleus.

Pileus 6 to 18 lines broad; stem about 1 in. long, .5 to 1 line thick.

Grassy ground. Pasadena. January.

Prof. McClatchie's notes say that this plant has the odor and flavor of butternuts and that it is delicious when cooked. Also that when fresh the pileus is tomentose and the margin even, but these characters are not clearly shown in the dried specimens.

PHOLIOTA ANOMALA. Pileus at first hemispherical or subconical, then convex, glabrous, hygrophanous, broccoli-brown when moist, pale-yellow or cream-color when dry; lamellae adnate or slightly decurrent, subarcuate, pale becoming brownish-ferruginous, often white on the edge; stem cavernous or hollow with irregular transverse partitions, sometimes containing a cottony tomentum, whitish, with a slight evanescent annulus; spores elliptical, .0003 to .0004 in. long, .00016 to .0002 broad.

Pileus 8 to 18 lines broad; stem 1.5 to 2.5 in. long, 1 to 3 lines thick.

Sticks and leaves lying on the ground. Pasadena. January. McClatchie.

The species belongs to the tribe Truncigenae, section Hygrophanae. It is well marked by its fugacious annulus, subdecurrent lamellae and peculiar cavernous stem.

HEBELOMA FOEDATUM. Pileus fleshy, convex becoming plane or centrally depressed, glabrous, very viscid or glutinous, reddish cinnamon, flesh yellowish-white; lamellae subventricose, emarginate with a decurrent tooth, cinnamon-color, becoming mummy-brown; stem solid, equal or slightly thickened at the base, fibrillose, paler than the pileus; spores broadly elliptical, .00024 to .0003 in. long, .00016 to .0002 broad.

Pileus 1.5 to 3 in. broad; stem 1.5 to 2.5 in. long, 2 to 4 lines thick.

Streets of Pasadena. December. McClatchie.

The species is apparently related to *H. firmum*, *H. testaceum* and *H. glutinosum*, from all of which it is separated by its small spores. Its viscid pileus causes dirt to adhere to it in such quantity as to give the plant a very defiled, unattractive appearance.

FLAMMULA ANOMALA. Pileus deeply umbilicate or infundibuliform, often irregular, glabrous, whitish; lamellae narrow, close, decurrent, pale-ferruginous; stem short, irregular, whitish; spores globose, brownish-ferruginous, .00024 in. broad.

Pileus about 1 in. broad; stem 6 to 12 lines long.

Plant commonly caespitose. Ground. Trexlertown, Pennsylvania. October. Dr. William Herbst.

A whitish umbilicate pileus is unusual among species of Flammula. This plant appears to belong to the tribe Gymnotae.

TUBARIA PALLESCENS. Pileus fleshy but thin, convex or nearly plane, sometimes slightly depressed in the center, glabrous, hygrophanous, brick-red when moist, yellowish or cream color when

dry; lamellae broad, adnate or slightly decurrent, tawny-buff, becoming brownish-ferruginous; stem slender, hollow, yellowish, with a white mycelium at the base; spores elliptical, .0003 in. long, .00016 broad.

Pileus 5 to 10 lines broad; stem 12 to 18 lines long, .5 to 1 line thick.

Sticks and leaves under trees. Pasadena. January. McClatchie.

When young, slight vestiges of a veil are visible, connecting the incurved margin of the pileus with the stem.

PLUTEOLUS LUTEUS. Pileus thin, at first subovate, then convex or subcampanulate, glabrous, viscid, slightly striate on the margin, yellow; lamellae numerous, close, free or but slightly adnexed, yellowish becoming ferruginous; stem slender, hollow, slightly thickened toward the base, striate at the top and there sprinkled with mealy particles, yellowish; spores elliptical, .0004 to .0005 in. long, .00024 to .0003 broad.

Pileus 6 to 12 lines broad; stem 1.5 to 2.5 in. long, 1 to 2 lines thick. Plant very fragile, gregarious. Under trees. Pasadena. December. McClatchie.

The yellow color and viscid pileus are prominent characters of this species. In some of the dried specimens the lamellae appear free, in others slightly adnexed, but because of the viscid pileus I have referred the plant to the genus Pluteolus.

CORTINARIUS VIRGATUS. Pileus thick, fleshy, hemispherical or convex, obtuse or subumbonate, slightly viscid, ochraceous tinged with olive-buff, conspicuously virgate with reddish fibrils, flesh dingy-white; lamellae subdistant, adnexed, at first subcinnamon, then ochraceous-russet; stem short, stout, solid, enlarged and fibrillose at the base, pale-ochraceous; spores subglobose or broadly elliptical, .00024 to .0003 in. long, .0002 to .00024 broad.

Pileus 3 to 4 in. broad; stems about 2 in. long, 8 to 12 lines thick.

Under oak trees. Pasadena. February. McClatchie.

This species is well marked by its stout habit and by the reddish fibrils of the pileus.

AGARICUS CALIFORNICUS. Pileus at first subconical, becoming convex, minutely silky or fibrillose, whitish, tinged with purple or brownish-purple on the disk, flesh whitish; lamellae close, free, pink becoming purplish, then blackish-brown; stem rather long, solid or stuffed, equal or tapering upward, distinctly and rather abruptly narrowed above the entire externally silky annulus, pallid

or brownish; spores broadly elliptical, .0002 to .00025 in. long, .00016 to .0002 broad.

Pileus 1 to 3 in. broad; stem 1.5 to 3 in. long, 2 to 4 lines thick.

Under oak trees. Pasadena. January. McClatchie.

This fungus is similar in size, shape and habitat to *A. hemorrhoidarius*, but it is unlike that species in color, in the adornment of the pileus and in its color not changing where bruised or broken.

STROPHARIA BILAMELLATA. Pileus fleshy, convex, even, whitish or yellowish, flesh pure white; lamellae close, adnate, purplish-brown when mature; stem short, solid, white, with a well-developed pure white annulus which is striately lamellate on the upper surface; spores elliptical, purplish brown, .0004 in. long, .0002 to to .00024 broad.

Pileus 1 to 2 in. broad; stem about 1 in. long, 3 to 4 lines thick.

Streets of Pasadena. January. McClatchie.

This fungus is remarkable for the lamellated upper surface of the rather thick membranous annulus. These lamellae are uneven on the edge and in some cases they appear to extend upward on the stem till they meet the true lamellae. The plant is said by its discoverer to be edible. The color of the young lamellae is not shown by the examples.

HYPHOLOMA LONGIPES. Pileus thin, campanulate, even or obscurely striate on the margin, fibrillose becoming glabrous, hygrophanous, yellowish-brown when moist, brown or isabelline-brown when dry, the margin appendiculate with the very white floccose fugacious veil; lamellae narrow, close, adnate, white or whitish, becoming nearly black, often whitish on the edge; stem slender, long, hollow, striate at the top, white, with a white mycelioid tomentum at the base; spores elliptical, .0005 in. long, .0003 broad.

Pileus 1 to 1.5 in. broad; stem 2 to 5 in. long, 1 to 2.5 lines thick.

Plant fragile, growing among fallen leaves in very wet weather. Pasadena. September. McClatchie.

The disk of the pileus is so thin and the stem so completely hollow to the apex that in the dried specimens there is a depression or umbilicus in the center of the pileus.

PANAEOLUS INTERMEDIUS. Pileus campanulate or convex, even, glabrous, moist or hygrophanous, grayish-brown; lamellae ascending or subarcuate, subdistant, adnate, black when mature; stem slender, often elongated, hollow, grayish-brown, white-pruinose at the top; spores oblong-elliptical, .0005 to .0006 in. long, .00025 to .0003 broad.

Pileus 6 to 12 lines broad; stem 2 to 4 in. long, .5 to 1 line thick.

Rich soil along gutters or in cañons. Pasadena. January. McClatchie.

The margin of the pileus does not extend beyond the lamellae, and this character with the slender stem suggests the genus Psathyrella, but because of the absence of striae on the pileus it seems best to refer the plant to the genus Panaeolus.

PANAEOLUS DIGRESSUS. Pileus hemispherical or convex, glabrous, bay-red; lamellae very broad, plane, distant, adnate, purplish black with a white edge; stem short, floccose-fibrillose toward the base, striate at the apex, hollow, a little paler than the pileus; spores broadly elliptical, .0005 to .0006 in long, .00035 to .0004 broad.

Pileus 4 to 6 lines broad; stem about 1 in. long, 1 line thick. On dung. Pasadena. July. McClatchie.

This plant also diverges from the generic character in its lamellae extending quite to the margin of the pileus, and in its unpolished stem.

COPRINUS CALYPTRATUS. Pileus when mature adorned with a few grayish floccose scales and crowned with a persistent stellately split membranous dingy-yellow or subtawny calyptra, radiate striate to the disk, grayish-flocculent along the ridges of the striae, blackish; lamellae free, dark lead color becoming black; stem equal, hollow, white, becoming blackish in drying except at the base, neither annulate nor distinctly volvate; spores elliptical, black, .0006 to .0008 in. long, .00045 to .0005 broad.

Pileus about 2 in. broad; stem 3 to 4 in. long, 2 to 3 lines thick. Open cultivated ground. Rockport, Kansas. August. E. Bartholomew.

This species is well marked by the persistent membranous calyptra that adheres to the summit of the pileus. Its margin is split into four to six broad rays. The change of color in the stem is similar to that ascribed to the stem of *C. sterquilinus* Fr., but our plant differs from that in its calyptra and in the absence of an an-

nulus and volva at the base of the stem. Only mature specimens were seen, consequently the characters of the young plant remain unknown and the description to that extent is defective.

COPRINUS JONESII. Pileus submembranous, campanulate becoming broadly convex or expanded and split or revolute on the margin, very blunt or truncate at the apex when young, everywhere covered with tawny-gray or pale-cervine floccose scales which wholly or partly disappear with age revealing the striate surface beneath; lamellae crowded, linear, free, at first white or whitish, becoming black; stem equal or slightly tapering upward, minutely floccose, hollow, white; spores black, broadly elliptical, .0003 to .00035 in. long, .00025 broad, with an apiculus at one end.

Pileus 1 to 2 in. broad; stem 2 to 3 in. long, 2 to 3 lines thick.

Plant fragile, sometimes caespitose. In a cellar. Vermont. April. Prof. L. R. Jones.

The species is closely related to *C. fimetarius*, of which it might easily be considered a variety, but it is easily distinguished by the truncate apex of the young pileus, the differently colored scales and the smaller spores. *C. soboliferus* Fr. has the pileus truncated at the apex, but it is a very different species.

COPRINUS APICULATUS. Pileus membranous, campanulate or deeply convex, acute or apiculate, furfuraceous, plicate-striate to the disk, grayish; lamellae few, subdistant, reaching the stem, black; stem filiform, glabrous, white; spores elliptical, black, .0003 in. long, .00016 broad.

Pileus about 3 lines broad; stem 1 to 1.5 in. long, scarcely half a line thick. Lewiston, Pennsylvania. Mrs. E. B. Noyes.

BOLETINUS BOREALIS. Pileus fleshy, convex, obtuse or subumbonate, brownish yellow, obscurely and somewhat reticulately streaked with reddish-brown lines; pores large, angular, unequal, slightly decurrent, brownish-yellow; stem short, equal or slightly tapering upward, brownish-yellow with a whitish mycelioid tomentum at the base; spores oblong, .0004 to .0005 in. long .00016 to .0002 broad.

Pileus 1 to 2 in. broad; stem about 1 in. long.

Sandy soil. Capstan Island, Labrador. October. Waghorne.

The markings of the pileus appear as if due to the drying of a glutinous substance. The radiating lamellae and the transverse partitions of the interspaces are very plainly shown. Described from two dried specimens.

BOLETUS INFLEXUS. Pileus convex, glabrous, viscid, yellow, often red or reddish on the disk, the margin thin, inflexed, concealing the marginal tubes, flesh whitish, not changing color where wounded; tubes rather long, adnate, yellowish, becoming dingy-yellow with age, the mouths small, dotted with reddish glandules; stem rather slender, exannulate, solid, viscid, dotted with livid-yellow glandules; spores yellowish, .0004 to .0005 in. long, .00016 to .0002 broad.

Pileus about 1 in. broad; stem about 2 in. long, 2 to 4 lines thick.

Open woods. Trexlertown. September. Herbst.

This *Boletus* belongs to the tribe Viscipelles. It is remarkable for and easily recognized by the inflexed margin of the pileus, which imitates to some extent the appendiculate veil of *Boletus versipellis*. It sometimes grows in tufts. The paper in which fresh specimens were wrapped was stained yellow. *Boletus Braunii* Bres. has an inflexed margin, but that is a much larger plant with a yellowish-brown pileus, a fibrillose stem and much smaller spores.

POLYPORUS ANCEPS. Effuso-reflexed or resupinate, inseparable from the matrix, firm, subcorky but flexible, white; pileus narrow, about 6 lines broad, laterally elongated or confluent, minutely downy, sometimes rugosely pitted; pores minute, subrotund, commonly 2 to 3 lines long, the dissepiments obtuse; mycelium white, permeating the bark and wood.

Dead trunk of hemlock, *Tsuga Canadensis*. Stony Brook, Massachusetts. October and November. Prof. E. A. Burt.

The plants are commonly resupinate, but sometimes reflexed, forming a narrow pileus about half an inch broad but extending laterally for several inches. They are suggestive of the first year's growth of *P. connatus* Fr., but they do not revive the next year, and they have a different habitat. Though differing somewhat in texture they are apparently related to such species as *P. semisupinus* and *P. semipileatus*, and with them they serve to connect the genus *Polyporus* with the genus *Poria*.

SPARASSIS HERBSTII.—Plants much branched, forming tufts 4 to 5 in. high and 5 to 6 in. broad, whitish, inclining to creamy-yellow, tough, moist, the branches numerous, thin, flattened, concrescent, dilated above and spatulate or fan-shaped, often somewhat longitudinally curved or wavy, mostly uniformly colored, rarely with a few indistinct, nearly concolorous, transverse zones

near the broad entire apices; spores subglobose or broadly elliptical, .0002 to .00025 in. long, .00016 to .0002 broad.

Trexlertown. August. Herbst.

The species is evidently closely allied to *S. spathulata* Schw., but differs especially in its paler color, with no rufescent hues, in its much more branching habit and in the absence of any distinct zones.

BATTARREA ATTENUATA. Exoperidium unknown; endoperidium 2 in. or more in breadth, the basal part hard, thick, even and concave beneath, convex above and somewhat coarsely reticulate by the bounding walls of broad shallow pits; stem 8 to 10 in. long, gradually attenuated toward the base, hard, almost woody, solid, rough except at the top with rather coarse spreading or reflexed scales, brown externally, rusty-brown within; spores globose, ferruginous, .0003 in. broad; threads of the capillitium destitute of spiral thickenings.

Plants commonly growing in tufts of 3 to 5 individuals.

Dry sandy soil. Nevada. Collected by C. W. Irish; communicated by Dr. Thomas Taylor.

The single dried specimen from which, with notes kindly communicated by the collector, the above description was derived, was past maturity and destitute of any volva or exoperidium. The upper part of the endoperidium, which is apparently membranous, had nearly all disappeared, and but a mere remnant of the spores and capillitium remained. It is very unsatisfactory to attempt the description of a species from such imperfect data, yet the characters seen are so peculiar and distinct that I have been willing to strain a point in order to make this remarkable plant known. It does not agree rigidly with the characters ascribed to the genus Battarrea, differing apparently in the solid stem, the absence of spiral thickenings in the capillitium threads and in the coarsely pitted subreticulate hymenial substratum, so that it might easily be taken as the type of a distinct genus.

The dried specimen has a strong, unpleasant odor, indicating its relationship to the Phalloideae. From the notes of Mr. Irish we learn that the long stem, which is about half an inch thick at the base and one and a half at the top, is almost wholly buried in the soil, and that the plants appear above the surface only in seasons after heavy snow falls, whose gradual melting has moistened the earth deeply.

TYLOSTOMA SEMISULCATUM. Peridium subglobose, usually a little longer than broad, 6 to 8 lines broad, 9 lines long, glabrous above, ferruginous-tomentose on the lower half; ostiolum entire, stem equal, about 2 in. long, even and glabrous or but slightly furfuraceous on the upper part, the lower part longitudinally sulcate, whitish; spores ferruginous, globose, .00016 to .0002 in. broad; threads of the capillitium colorless, not septate.

Sandy soil. Nevada. Collected by C. W. Irish; communicated by T. Taylor.

This species is separated from *T. mammosum* Fr. by its peridium, which is tomentose on the lower half and not depressed, and by its stem, which is distinctly furrowed in its lower half.

LYCOPERDON BELLII. Peridium about 2 in. broad, subglobose, sessile, grayish or yellowish-brown, exterior peridium continuous, adorned with numerous persistent hard angular irregular or substellate warts which are smaller toward the base, separable at maturity from the inner peridium and falling away in flakes or patches; the inner peridium thinner, paler, glabrous; capillitium composed of long slender interwoven, slightly colored and occasionally branched filaments, a little broader than the diameter of the spores; spores globose, olive-brown, .00024 to .00028 in. broad.

Rocky ground. Digges Island, Hudson's Bay. August. Collected by R. Bell; communicated by Prof. J. Macoun.

This puff-ball is peculiar in its continuous but warty exterior peridium, which is less friable than that of *L. separans*. The peridium appears to rupture irregularly, as in *Calvatia*. It is also well marked by the dark olive-brown spore mass.

EXCIPULINA OBSCURA. Perithecia cupulate, ¼ to ½ line broad, sessile, black, the margin at first incurved, then erect, thin; hymenium subgelatinous; spores subfiliform, curved, plurinucleate or obscurely pluriseptate, hyaline, .0012 to .0018 in. long, .00016 broad, supported on short sporophores.

Bark of hemlock trees, *Tsuga Canadensis*. Newfoundland. Waghorne.

MELASMIA IMITANS. Perithecia hypophyllous, membranous, variable in size and shape, commonly subelliptical or oblong, somewhat confluent in nerve-following lines, rugosely uneven, black, opening irregularly; spores subcylindrical, straight or nearly so, colorless, sometimes obscurely plurinucleate, .0008 to .0012 in. long, .00016 to .0002 broad, oozing out and forming pallid globular or irregular masses or short thick tendrils.

Lower surface of living fronds of *Pteris aquilina*. California. Prof. M. A. Howe.

This fungus imitates *Phyllachora pteridis* in habitat and general appearance, and might easily be supposed to be the conidial state of it. The lines of the perithecia are more narrow and less prominent. The masses of discharged spores are rather large and very numerous and partly conceal the black perithecia beneath them.

CAEOMA ABERRANS. Pustules suborbicular, slightly elevated, .5 to 1 line broad, at first covered by a whitish membrane which finally disappears revealing the mass of orange-yellow spores; spores subglobose or elliptical, smooth or nearly so, .0007 to .0009 in. long.

Bark of living alder. Newfoundland. May. Waghorne.

This fungus is peculiar in its habitat. The spores do not easily separate from each other, but possibly this is due in some measure to immaturity.

ASPERGILLUS SUBGRISEUS. Grayish; sterile hyphae creeping; fertile erect, continuous, simple, .0003 in. thick, terminating above in an inflated subglobose vesicle .0012 to .0016 in. broad; sterigmata none or obsolete; spores globose, .00016 in. broad.

On *Corticium amorphum*. Newfoundland. Waghorne.

This species is separated from the related *A. griseus* by its larger spores, continuous fertile hyphae and by the absence of distinct sterigmata.

LEPTOGLOSSUM LATUM. Club 3 to 6 lines long, nearly or quite as broad, soft when moist, rather fragile when dry, compressed and somewhat irregular, black; stem about as long as the club, black; asci clavate-cylindrical, .0045 to .005 in. long, about .0005 broad, 8-spored; spores crowded in the ascus, oblong or cylindrical, straight or slightly curved, continuous, obtuse, colorless, .001 to .0016 in. long, .0002 to .00024 broad; paraphyses colored, thickened at the top and sometimes recurved.

Sandy soil. Labrador. September. Waghorne.

A species very peculiar in its broad compressed club. The colored paraphyses are conspicuous under the microscope. They project slightly above the surface of the receptacle and give it a soft, almost velvety appearance.

VALSA BREVIS. Pustules numerous, rather prominent, perithecia 10 to 20 or more in a pustule, nestling in the inner bark; ostiola even, black, barely emerging from and dotting or oblitera-

ting the orbicular or elliptical erumpent subpulverulent disk; asci .0008 to .001 in. long; spores allantoid .00024 to .0003 in. long.

Bark of balsam fir, *Abies balsamea*. Labrador. Waghorne.

This fungus is allied to but differs from *Valsa Friesii* in its larger pustules, more numerous perithecia and shorter asci and spores. The color of the disk is grayish or grayish-green.

HYGROPHORUS NIGRIDIUS. Pileus fleshy, convex, obtuse or subumbonate, glabrous, grayish-brown or black-brown, often a little darker in the center, flesh white; lamellae distant, decurrent, white; stem rather slender, solid, brownish, white at the top; spores elliptical, .0004 to .0005 in. long, .00024 to .0003 broad.

Pileus 1 to 2 in. broad; stem 1 to 2 in. long, 2 to 4 lines thick.

Gregarious or rarely two or three united at the base. Pine and fir tree woods. Prince Edwards Island. October and November. J. MacSwain.

This fungus differs from *H. caprinus* Fr. in its smaller size, glabrous pileus and larger spores. A description of it was published in the Country Gentleman of November 29, 1894, but one is here given that it may be more readily accessible to mycologists.

In many of the foregoing descriptions I have been obliged to give the colors indicated by the dried specimens. It is not likely therefore that they will in all cases agree rigidly with the colors of the fresh plant.

Hypericum boreale (Britton) and related Species.

BY EUGENE P. BICKNELL.

At York Harbor, Maine, *Hypericum Canadense* L. abounds, presenting itself in varying forms; *Hypericum majus* (Gray) Britton frequently grows with it, either strongly typical or with aberrant tendency; *Hypericum mutilum* L. is common also.

More characteristic of the region, however, than any of these is a small species, which grows in abundance in open situations, about the muddy borders of pools or in moist sandy soil, and shows some interesting lines of variation. Some fragmentary specimens, collected in 1888, were pronounced by Dr. Britton to

be the little known *Hypericum Canadense* var. *minimum*,* a plant which had never been well understood, but which, on account of its narrow leaves, had been associated unhesitatingly with *H. Canadense*. Now, however, the study of a full series of specimens, collected at York Harbor in August, shows clearly that, though in one of its forms the plant certainly bears a strong general resemblance to forms of *H. Canadense*, its real affinity is with *H. mutilum*, to which, indeed, it is nearly allied. Certain noteworthy differences, however, forbid its direct reference to that species, and give it an identity which is unmistakable when once the plant is understood. These differences, moreover, prove to be constant over a wide area; at least there is nothing to discredit them in specimens which show the plant to have an extensive distribution, ranging along the coast and islands of Maine into Nova Scotia, and westward through Canada. That it also extends southward in the mountains is attested by a specimen from Luzerne county, Pennsylvania, and one from an elevated station in northern New Jersey.

It is to be noted of this New Jersey specimen that it shows a near approach to *mutilum* and may, perhaps, be taken as presumptive evidence that the two plants intergrade. If such be the fact, however, it is, after all, only a part of the complementary fact that elsewhere the same plants have reached a condition of complete separation. The sub-species of one region has become a full species elsewhere in its range.

In cases such as this of complete differentiation in one region, how are we to deal with intergradation in another? It is practicable to recognize a plant at the same time as a variety and as a species according as to whether it occurs in one or in another part of its habitat? It can only be said that if this condition of things exists in nature we cannot refuse to recognize it, and shall have to adjust our methods to it as best we may. But while we cannot dissect the facts of nature too delicately for certain purposes of botanical study, for other, more general purposes, we can often reach better practical results with duller tools. For general pur-

*Dr. Britton has since shown that the name *minimum* of Choisy is not properly applicable to this plant, and has therefore designated it *Hypericum Canadense* var. *boreale*. Bull. Torr. Club, 18: 365. 1891.

poses, therefore, what shall be our practice in cases similar to the one before us? The older idea would appear to have been, Somewhere a variety, everywhere a variety; with equal, as it seems to me with better reason, it may be held, Somewhere a species, everywhere a species; that is to say, everywhere where individuals of such a *regional species* are found upholding the characters which distinguish their type in the region of its perfect emancipation. Let *intermediates* be frankly accepted as intermediates, not feared or avoided as elements of confusion or as being necessarily prejudicial to this or that otherwise unexceptionable "species"; let them be sought for and studied; in time we may come to learn from them, in one case perhaps, that they represent weakening links between diverging forms; in another, that they afford indices to old relationships; in yet another, it may be that they mark the first steps in a union of two allied species into a broader single one.

Upon these views the plant here defined is named with specific rank as *Hypericum boreale* (Britton). The conceptions of other botanists may require them to write *Hpericum mutilum boreale*, or, if even more conservative, *Hypericum mutilum* var. *boreale*. In any case, the fact of nature sought to be expressed is the same.

HYPERICUM BOREALE (Britton). From 1–18 in. high, mostly 3–8 in.; stem obscurely quadrangular to terete, upright from an assurgent, or reclined and rooting base, rarely erect from the root, simple or cymose-branched. Main stem-leaves from elliptic-linear to narrowly oblong and elliptic-oblong, or one or two pairs in the cyme sometimes slightly broadened to a sub-clasping base, those of the lower part of the stem much reduced and crowded, oval to short-oblong, at the very base of the stem sometimes thickened and transformed into small lanceolate overlapping scales. The small form of the plant which has been known as *H. Canadense* var. *minimum*, has a simple stem, leafy-cymulose at the top, bearing many pairs of nearly linear or linear-oblong leaves, sometimes no larger than 3″–4″ × 1″. Another small form has fewer short-oblong obtusely rounded, small leaves, mostly narrowed to the base, but the pair which subtends the cymule sometimes broadened and sub-clasping. Larger plants may be cymose-branched, even from the base, with narrowly oblong or elliptic leaves reaching an extreme size of 16″ × 3″ or 4″. Cymes leafy-bracted throughout, varying from very simple and few-flowered to compound and contractedly many-flowered. Bracts foliaceous throughout, oblong to linear, obtuse. Sepals

linear to oblong-linear, obtuse. Flowers about 2½″ broad. Capsules 2″–2½″ long by 1″–1¼″ broad, oblong, rounded or abruptly contracted to the apiculate apex, membranaceous and strongly cross-wrinkled, the exposed portion deep purplish in color almost from the first, and conspicuously exceeding the sepals. Seeds relatively large, .03 inch long, linear, 3–5 times longer than broad, pale, strongly longitudinally furrowed and minutely cross-lined, under the microscope suggesting a miniature ear of corn.*

As compared with *boreale*, *mutilum*, though having sometimes the assurgent base of the stem, is commonly erect from the root, the stem distinctly quadrangular, the stem-leaves, which reach an extreme size of 14′×7″, are throughout larger and much broader, and vary in shape from ovate-orbicular to ovate-oblong, often gradually narrowed from the broadly-dilated base to the obtuse tip, sometimes oblong, but always with a broad sub-clasping base; 5–7-nerved, thin and much reticulated instead of thicker and often 3-nerved, with the reticulation sparse, obscure or wanting; the cymes more compound and delicately dichotomous, with minute and setaceous instead of leafy bracts; the capsule smaller, even only half the size (1′–2″×½″–1″), mostly ovoid- or oblong-conical, often but little exceeding the sepals, commonly greenish or, in age, greenish-purple, instead of early deep purple; the seeds smaller, oblong, only 2–3 times longer than broad, yellowish-brown and shining instead of dull whitish, very minutely cross-wrinkled, not furrowed, but sometimes indistinctly striate.

The seeds of *boreale*, while differing strikingly from those of *mutilum*, resemble somewhat those of *Canadense*, which, though

* Besides the York Harbor series, specimens of *Hypericum boreale* have been examined, as follows:

Somesville, Mount Desert Island, Maine, Aug. 25, 1890, Edward L. Rand.

Prince Edward's Island, Aug. 2, 1888, John Macoun.

St. John's, Newfoundland, Aug. 6, 1894, B. L. Robinson and H. Schrenk.

Notre Dame du Lac, Termiscouta Co., Canada, Aug. 13, 1887, John I. Northrop.

"Vermont."

Lily Lake, Luzerne Co., Pa., Aug. 16, 1889, John K. Small.

Morris Pond, New Jersey, Sept. 11, 1890, N. L. Britton.

This last is the apparently intermediate specimen already referred to. It is the only example seen in which there are any minute bracts in the cymes.

Hooker's description of *H. quinquenervium* of Walter, in Fl. Bor. Am. 1: 110, clearly refers to *H. boreale*, as here defined, and as clearly excludes true *H. mutilum*, of which *quinquenervium* is a synonym. The habitat of the plant is given as "Canada to Lake Winipeg. Dr. Richardson. Frequent in upper Canada."

shorter, are of the same pale color, and are evidently striate—striate-angled, however, rather than furrowed. The seeds of *majus* prove to differ from those of *Canadense* in respect of size, color and surface character, much as those of *mutilum* differ from those of *boreale*. The broad-based leaves of *majus* and *mutilum* here comes to mind and suggests a sort of parallelism between *Canadense* and *majus* on the one hand and *boreale* and *mutilum* on the other.

It may be noted that *majus* has the smallest and narrowest seeds of the entire series; *boreale*, the smallest plant of all, having the largest seeds.

The relationship between *Canadense* and *boreale* needs no extented comment. It is true that from the leaves alone some forms of each plant would scarcely be regarded as different, but the character of the inflorescence of each is perfectly destinctive: *Canadense* will be found to differ constantly in its more strict and compound, minutely bracted cymes, with more or less tapering capsules and calyx lobes.

It has just been said that forms of *Canadense* cannot by the leaves alone be separated from forms of *boreale*. This is equally true of *majus*. All three species assume in some of their states a narrowly oblong form of leaf which is practically the same in all. In specimens of *majus*, however, which exhibit this form of leaf, the other distinctive characters remain unimpaired: it maintains the large pod, long tapering sepals, and characteristic seeds. Not so, however, *Canadense*. In the oblong-leaved form collected at York Harbor, there is a general difference also in the inflorescence and capsules; the cyme is less strict and more delicately branched, even becoming somewhat diffuse, and the short-pedicelled capsules are more numerous and crowded, and only about half the usual size, 1″–2″ instead of 2″–3″ long; the seeds also take on a darker color, and seem to approach those of *mutilum*. Indeed, some examples of this form have much similarity to less branched forms of *mutilum*, and actually seem to be implicated somehow with that species. In fact, in the case of some immature specimens, it can scarely be said to which species they belong.

Compared with fully typical *Canadense*, this form presents a striking contrast, and in studying the group I have found it convenient to label it var. *parvicarpum*.

Further Remarks on Family Nomenclature.

By Dr. V. Havard.

It is generally admitted that the animal and vegetable kingdoms cannot be classified on the same lines and divided into groups of the same value. Species and genera are nearly identical in the two kingdoms, but as we rise above genera the similarity is less apparent and the higher we go the more doubtful becomes the analogy between the groups, so that near the summit of the scale no comparison is possible. This is due to the great dissimilarity in the nature of the organisms, the infinitely more numerous and varied functions of animals and the greater difficulty of ascertaining their natural relationship. From these considerations it follows that the application to both kingdoms of one uniform and identical nomenclature is impracticable; but, were it otherwise, the desirability of different and distinctive endings would still be manifest.

Zoölogists appear to have reached a satisfactory uniformity in the terminations of the names of their principal groups. As early as 1845, the Association of American Naturalists, convened at New Haven, adopted the following proposition:

"It is recommended that names of families should end uniformly in *idae* and sub-families in *inae*."

These endings were then in general use; they were confirmed at the meeting of the A. A. A. S., in 1877, and are now invariably accepted. The name of the family or sub-family is *always* that of one of its genera with the above endings. It is to be noticed, however, that animal families usually contain but few genera, not rarely only 2 or 3, often only 3 to 5, and seldom more than 10 or 15. Perhaps they might be more correctly assimilated to botanical tribes. The term *tribe* appears to be very seldom used by zoölogists, the name of the group intermediate between the family and genus being mostly *sub-family* in *inae*.

A cause of confusion, as pointed out by Mr. L. M. Underwood in the March Bulletin, is the variable conception of *order*, being considered by phanerogamic botanists a synonym of *family*, while, by zoölogists and the majority of cryptogamists, it is applied to the

next higher group above family. It seems to me that a desirable step in the direction of uniformity would be taken if all botanists would, in this regard, conform to the usage of zoölogists; for, although we need not strive after similarity of nomenclature in the two kingdoms, yet we should avoid, so far as practicable, the use of the same appellations with a distinctly differeut meaning.

The termination in *aceae* is the one now generally accepted by botanists for family names. It is strictly in accordance with good Latin and otherwise unobjectionable. The vexed question is, can it and must it be applied in all cases? A. de Candolle in his "Laws of Botanical Nomenclature" (1867) establishes three exceptions:

1st. When the genus from which is derived the family name ends in *ix* or *is* (genitive *icis*, *idis* or *iscis*) the termination *iceae*, *ideae* or *ineae* is admitted: SALICINEAE, BERBERIDEAE, TAMARISCINEAE.

2d. When the genus from which the family name is derived has a name of unusual length, and there is no tribe founded upon it, the termination in *eae* is admitted: DIPTEROCARPEAE from *Dipterocarpus*.

3d. For a few large families, named long ago, and now everywhere known under their irregular names, the latter are maintained: CRUCIFERAE, LEGUMINOSAE, GUTTIFERAE, UMBELLIFERAE, COMPOSITAE, LABIATAE, CUPULIFERAE, CONIFERAE, PALMAE, GRAMINEAE.

These exceptions, when formulated, expressed the best conservative usage of the day, but it is apparent they have lost much of their strength and I doubt whether their illustrious author would now insist upon the first two. The first has long since been disregarded; thus in Gray's Manual, as well as in Pflanzenfamilien and Baillon's Histoire des Plantes, we have SALICACEAE, BERBERIDACEAE, PLANTAGINACEAE, ORCHIDACEAE, AMARYLLIDACEAE, etc. The length of the name is a point upon which we need not dwell; so long as a name is correctly constructed the number of syllables cannot be of much moment; thus in Baillon's Histoire we have DIPTEROCARPACEES and CENTROLEPIDACEES, and in Pflanzenfamilien, POTAMOGETONACEAE, HYDROCHARITACEAE, etc. It is therefore obvious that whenever the name of a family is de-

rived from that of a genus the termination in *aceae* is applicable *without exception.*

The third exception presents serious difficulties. Here the family name is descriptive, that is, not based upon a genus but derived from some structural characteristic. Can the ending *aceae* be applied to it? This ending (from *akos* or *acus*) is an adjective-suffix, and therefore only applicable to a substantive, *e. g.*: *rosa, rosaceus; lilium, liliaceus*, &c., the e being inserted for reasons of enphony. It cannot be affixed to adjectives (like *compositus, coniferus, leguminosus, gramineus*, &c.), and such names as COMPOSITACEAE, CONIFERACAE, &c., with two adjective terminations, are obviously inadmissible. But it happens that all family descriptive names (COMPOSITAE excepted) are based upon a substantive (*conus, umbella, crux, legumen, labium, cupula, gramen*, &c.), so that we can replace the ordinary and variable adjective-ending by the uniform *aceae* and correctly form such family names as CONACEAE, UMBELLACEAE, LEGUMINACEAE, practically equivalent to CONIFERAE, UMBELLIFERAE, LEGUMINOSAE. The principle was recognized by Linnaeus who adopted such descriptive names as AMENTACEAE, PAPILIONACEAE, SPATHACEAE, &c.

But admitting, as we may, that CONACEAE and LEGUMINACEAE are as correctly constructed as ROSACEAE and LILIACEAE, it is still true that, although with the same ending, they convey an entirely different meaning; the former are plants *with* cones, *bearing* legumes, while the latter are plants *like* the Rose, *similar to* the Lily; the former imply the possession of a certain character, the latter imply similitude to a type genus. Clearly this is not admissible. The uniformity we are striving for must be not only in outward form but likewise in the mode of construction and inward meaning.

We are thus forced to the conclusion that the ending *aceae* is inapplicable to the names under consideration, and that no change in their construction is possible or advisable. What is then to be done? Two alternatives offer themselves: Leave them alone, as they have stood for several generations of botanists, or abolish and replace them by the first published generic names as proposed by Mr. Barnhart. The latter course will commend itself to all who think uniformity essential, and is urged upon us by the example

of zoölogists, but such a radical change will not be easily acquiesced in. In the case of zoölogists, the family usually containing only few genera, it is comparatively easy to adopt the name of one of them for that of the family, and, as a rule, the characters of the adopted genus will not as widely differ from those of the other genera as, say, *Fragaria* does from *Prunus*, *Cassia* from *Trifolium* or *Pinus* from *Ginkgo*, so that such name is readily acceptable as representative of the family. It happens that the botanical families in question are among the largest of the vegetable world and it seems difficult to recognize CASSIACEAE as the representative of all LEGUMINOSAE, and AMMIACEAE as that of all UMBELLIFERAE. The difficulty would be lessened if botanists, instead of extending the boundaries of families as has been the tendency in recent times, endeavored to restrict them to the lowest admissible limits, those, for instance, of several of our well defined suborders.

I am not prepared to make a choice between the two alternatives. Perhaps a majority of botanists would now prefer that the old familiar names be maintained. Be that as it may, a decision will soon impose itself and, judging from the present trend of thought, at least in this country, it is safe to predict that long and honorable usage will eventually be sacrificed to the claims of uniformity and stability.

If we admit the law that the family name must in all cases be based upon that of a recognized genus, we still have difficulties to surmount; what is a "recognized" genus? The comparative instability of genera is well known; authors do not agree upon their value and limitations; should the family name be exposed to this insecurity? The danger of possible changes from that source is very much mitigated by A. De Candolle's law:

"An old genus name which has become the name of a section or species can be maintained as the radical of a family name: LENTIBULARIACEAE from *Lentibularia*, HIPPOCASTANACEAE from *Aesculus Hippocastanum*, CARYOPHYLLACEAE from *Dianthus Caryophyllus*, etc."

If this law can be accepted by nomenclature reformers, their path will be made much smoother and we shall be the more readily inclined to follow them thereon.

New or noteworthy North American Phanerogams.—IX.

By N. L. Britton.

Carex Baileyi Britton, n. sp.

Carex tentaculata var. *gracilis* Boott, Ill. 94. 1860. Not *C. gracilis* R. Br.

Carex lurida var. *gracilis* Bailey, Mem. Torr. Club, 1: 11. 1889.

After observing this plant over a wide range of territory for several seasons, I have concluded to propose it as a species. I obtained crucial proof of its distinctness from *C. lurida* last autumn by finding the two growing side by side near Lake Placid, N. Y. I think the following description will readily identify it. It affords me much pleasure to associate the name of my friend, Prof. L. H. Bailey, with this very beautiful sedge.

Glabrous, culms erect or reclining, very slender, minutely scabrous above, 1°–2° long. Leaves slightly scabrous, elongated, 1″–2″ wide, the upper and the similar bracts exceeding the culm; staminate spike solitary, short-peduncled; pistillate spikes 1–3, narrowly cylindric, very densely many flowered, all erect or ascending, 9″–2′ long, about 4″ in diameter, the upper sessile, the lower more or less stalked; perigynia inflated, ovoid, 2½″–3″ long, ascending, abruptly contracted into the subulate 2-toothed beak, prominently several-nerved, the lower about equalling, the upper longer than the linear-subulate ciliate-scabrous scale; stigmas 3.

In bogs, Vermont to Pennsylvania, Virginia and Tennessee along the mountains.

Another species has recently been distributed as *C. Baileyi* from the Herbarium of Harvard University, but no description of it has appeared, and I am informed by Dr. B. L. Robinson that it is probably *C. Raeana* Boott, in which conclusion I concur.

Carex Asa-Grayi hispidula (A. Gray) Bailey, Bull. Torr. Club, 20: 427. 1893.

Carex Grayi var. *hispidula* A. Gray; Bailey, Mem. Torr. Club, 1: 54. 1889.

The occurrence of trichomes on the perygynia in *Carex*, while a very strong character in some groups, is evidently a poor one in others. In the species under consideration it is so variable that it does not seem to me to warrant the separation of the proposed

variety, especially as this does not appear to have other characters nor any well marked distribution as compared with the glabrous plant.

CAREX WALTERIANA Bailey, Bull. Torr. Club, **20**: 429. 1893.

This is another species whose perigynia vary from glabrous to quite densely pubescent. Professor Bailey has proposed (loc. cit.) a variety *brevis* for those with glabrous perigynia. I find the pubescence exceedingly variable; it is true, as he remarks, that the northern plants tend to have no pubescence, while the southern ones have a great deal, but I have New Jersey specimens in which the perigynia are hairy at the base and South Carolina specimens whose perigynia are very nearly glabrous. Under these circumstances I see no desirability of separating the northern plant as a variety.

CAREX BULLATA Schk. A form of this species with solitary long-stalked spreading pistillate spikes is collected by Mr. Lighthipe at Sand Hills, Middlesex Co., N. J. It was erroneously recorded in my Catalogue of Plants found in New Jersey as *C. Olneyi*, which, after an examination of several authentic specimens, I refer with confidence to *C. monile*.

CAREX HARTII Dewey Am. Journ. Sci. (II.) **41**: 226. 1866.

Carex retrorsa var. *Hartii* A. Gray, Man. Ed. 5, 600. 1867.

Examination of a considerable suite of specimens convinces me that this is a species distinct from *C. retrorsa*. I append a description:

Glabrous, culms very slender, smooth or very slightly scabrous above, erect or reclining, 1½°–2½° long. Leaves elongated, rough on the margins and lower side of the midvein, 2″–3″ wide, the upper and the similar bracts much overtopping the culm; staminate spikes 1 or 2, the lower sometimes pistillate at the base, borne on a stalk ½′–1′ long; pistillate spikes 2–4, scattered, rather loosely many-flowered, the upper sessile, the lower slender-stalked, 1′–2′ long, about ½′ thick, all erect or ascending; perigynia inflated, ovoid-conic, spreading or the lower somewhat reflexed, prominently few-nerved, about 3″ long, gradually tapering into the long 2-toothed beak, 2–3 times as long as the lanceolate acute or acuminate scale; stigmas 3.

In marshes, Ontario to central New York (and Pennsylvania?) west to Michigan.

CAREX ATRATIFORMIS Britton.

Carex ovata Rudge, Trans. Linn. Soc. 7: 96. *pl.* 9. 1804. Not Burm.

Carex atrata var. *ovata* Boott, Ill. 114. 1892.

This plant appears to me constantly different from the European *C. atrata;* I characterize it is as follows:

Glabrous, culms very slender, erect, sharp-angled, scabrous above, 8′–2° tall, leafy only below. Leaves smooth or but slightly scabrous, 1″–1½″ wide, rarely over 6′ long, much shorter than the culm; spikes 2–5, dense, oblong or oblong-cylindric, 4″–12″ long, about 2½″ in diameter, the terminal one usually staminate at the base and sessile or nearly so, the others filiform-stalked and drooping when mature; lower bracts ½′–1½′ long, very narrow, the upper ones subulate; perigynia flattened, ovate or nearly orbicular, puncticulate, ascending, about 1″ long, tipped with a very short minutely 2-toothed beak; scales reddish-brown, oblong, obtuse or subacute, slightly narrower than and about equalling the perigynia; stigmas 3.

Newfoundland to the mountains of New England, west to the Northwest Territory.

CAREX STRICTA XEROCARPA (S. H. Wright).

Carex xerocarpa S. H. Wright, Am. Journ. Sci. (II.) 42: 334. 1866.

This appears to me to be a very well marked variety, if not a species distinct from *C. stricta* Lam. The pistillate spikes are almost filiform, loosely flowered and about 1″ in diameter. Besides original specimens collected in central New York by the describer of the species, I have it from Illinois, collected by J. Wolf.

CAREX HAYDENI Dewey, Am. Journ. Sci. (II.) 18: 103. 1854.

Carex aperta Carey in A. Gray, Man. 547. 1848. Not Boott.

Carex stricta var. *decora* Bailey, Coult. Bot. Gaz. 13: 85. 1888.

Professor Bailey has shown that the plant referred to *C. aperta* Boott, in the earlier editions of Gray's Manual, is not the same as the species of the Northwest to which the name was originally applied. I am confident that it is specifically distinct from *C. stricta.* I refer it to *C. Haydeni* with hesitation, although examination of an immature authentic specimen indicates that this name may be correctly applied to it. The species may be characterized as follows:

Glabrous, similar to *C. stricta* but smaller, culm slender, scabrous above, seldom over 2° high. Leaves 1″–1½″ wide, rough-margined, shorter than or sometimes overtopping the culm, their sheaths slightly or not at all fibrillose; lower bract foliaceous, about equalling the culm; staminate spikes linear-cylindric, 6″–15″ long, about 2″ in diameter, erect or somewhat spreading, all sessile or nearly so, sometimes with a few staminate flowers at the summit; perigynia orbicular, obtuse, about ½″ broad, faintly 2–4-nerved, minutely beaked, the orifice entire; scales lanceolate, purplish, spreading, very acute, about twice as long as the perigynia; stigmas 2.

In swamps, New Brunswick to Western Ontario, south to Rhode Island, Pennsylvania, Wisconsin and Nebraska.

CAREX COSTATA Schwein. Ann. Lyc. N. Y. 1: 67. 1824. Not Presl, 1819.

Carex virescens var. *costata* Dewey, Am. Journ. Sci. 9: 260. 1825.

My observations on this plant lead me to believe it constantly different from *C. virescens* Muhl. As the name applied to it by Schweinitz has been used before, I propose for it CAREX COSTELLATA and give its characters as follows:

Similar to *C. virescens* but taller and more spreading, culms slender, 1°–2½° long. Leaves 1½″–2″ wide, pubescent, especially on the sheaths, shorter than the culm, the upper one and the similar lower bract sometimes overtopping the spikes; spikes 2–5, narrowly cylindric, many-flowered, rather loose, ½′–1½′ long, 1½″ in diameter, erect or slightly spreading, the terminal one staminate below, the lower one commonly filiform stalked; perigynia oblong, densely pubescent, narrowed at each end, strongly several-ribbed, 1″ long, rather more than ½″ thick, beakless, the orifice entire; scales ovate, scarious-margined, acuminate or cuspidate, shorter than the perigynia; stigmas 3.

In woods, Maine and Ontario to North Carolina, chiefly along the mountains.

ALLIONIA BUSHI n. sp. Low, glabrous, somewhat fleshy; stem nearly white, diffusely branched, about 8′ high, the branches slender, widely divergent; leaves narrowly linear, sessile, 1′–3′ long, 1″–1½″ wide, blunt, their width almost uniform from base to apex; involucres clustered at the ends of the branches, at first campanulate and longer than the flowers, at length rotate and becoming 10″ broad, membranaceous, pubescent, finely reticulate-veined, their 3 short lobes semi-circular, rounded, the mid-veins prominent.

In dry ground. Jackson county, Missouri. August, 1893. B. F. Bush.

Resembles *A. Bodini* (Holzinger) Morong, which is much more slender, its involucres short-pedicelled in the axils, the lobes ovate-oblong and acute.

RANUNCULUS ALLEGHENIENSIS n. sp.

Similar in aspect to *R. abortivus* and *R. micranthus*, glabrous, stem widely branched, 1°–2° tall. Radical leaves reniform or suborbicular, 6″–2′ wide, long-petioled, crenate or some of them lobed, the teeth and lobes subacute; stem leaves sessile or the lower petioled, divided nearly or quite to the base into linear acute entire toothed or cleft segments; flowers about 2″ broad; petals oblong, glandular, not exceeding the calyx; head of fruit sub-globose or oblong, 2″ in diameter; receptacle linear, about 2″ long, pubescent; achenes slightly compressed and margined, tipped with subulate hooked or recurved styles of about one-half their length.

Mountains of Virginia and North Carolina. April–May.

BRASSICA JUNCEA (L.) Cosson, Bull. Soc. Bot. France, **6**: 609. 1859.

Sinapis juncea L. Sp. Pl. 668. 1753.

Annual, glabrous, somewhat succulent, stem erect, usually stout, 2°–4° tall. Lower leaves runcinate-pinnatifid and dentate, long-petioled, 4′–6′ long, the uppermost sessile or nearly so, lanceolate or linear, commonly entire, much smaller; fruiting racemes sometimes 1° long; pods erect or nearly so on slender ascending pedicels, not appressed to the axis, 1′–2′ long, rather more than 1′ wide, the conic-subulate beak one-fourth to one-third the length of the body.

This plant has been sent to me from a number of points during the past three years and I have collected it twice myself. It seems to be fairly naturalized in some regions. As represented in the specimens examined, it is readily distinguished from *B. Sinapistrum* Boiss. by the total absence of the hispid pubescence of that species and by its erect longer and subulate-beaked pods.

In waste places, Southern New York and Pennsylvania to Michigan and Virginia. Adventive or naturalized from Asia. Also introduced into the West Indies and South America.

CHIMAPHILA Pursh. Additional proof of the non-publication of *Pseva* Raf., as an older name for this genus is to be found in Rafinesque's review of "A Manual of Botany for the Northern

States, compiled by the Editor of Richard's Botanical Dictionary," Albany, 1817. The author of this work is reported to have been Prof. Amos Eaton. Rafinesque's review is printed in the "American Monthly Magazine," 1: 426–430, September, 1817, where among his criticisms he remarks, "He (Eaton) has not adopted the good genera *Chimaphila* Pursh," etc.

Descriptions of new Leaves from the Cretaceous (Dakota Group) of Kansas.*

By Arthur Hollick.

(Plates 236, 237.)

During the past year one of the students† at Columbia College was engaged under my direction in overhauling and naming the Dakota Group material in the Geological Museum, with instructions to put aside all specimens which could not be satisfactorily identified. I take pleasure in saying that the specimens now under consideration were the only ones, except a few fragments not capable of being satisfactory determined, which he found necessary to thus separate; also to state that they apparently represent three species and one variety new to the horizon, and to give him credit for having recognized them as posessing characters different from those of any published plates or descriptions with which they could be compared. All are from the vicinity of Fort Harker, Kans.

Sassafras (Araliopsis) Lesq.

This subdivision of the genus *Sassafras* was made by Lesquereux to contain a number of leaves which might be classed with either *Sassafras* or *Aralia*. Their systematic position is yet problematic, but they are included under the former genus in his posthumous Flora of the Dakota Group, edited by F. H. Knowlton. (Monog. xvii. U. S. G. S., 1891.)

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* Read by title at the meeting of the New York Academy of Sciences, February 11, 1895.

† Mr. Chas. R. Pollard, now Assistant Curator of the National Herbarium.

SASSAFRAS (ARALIOPSIS) DISSECTUM SYMMETRICUM n. var.

(Plate 236.)

Differs from *S.* (*A.*) *dissectum* Lesq. Cret. & Tert. Fl. 57; Fl. Dak. Gr. 101. *pl. 14. f. 1*, in its symmetrical branching, especially that of the lateral primaries, which start from the base of the leaf exactly opposite to one another and fork at an equal distance above; also in the fact that the blade of the leaf is not decurrent along the petiole, but ends at the point where the lateral primaries branch from the midrib.

I was at first inclined to describe this as a new species, but the imperfect condition of the upper portion of the specimen seemed to render this inadvisable, and its substantial agreement in essential particulars with *S.* (*A.*) *dissectum* decided me to class it as a variety of that species.

CISSITES HEER.

This genus was founded by Heer, to include leaves presumably allied to *Cissus*, but subsequently made by other authors to include leaves having more or less resemblance to *Vitis*, *Platanus*, *Sassafras*, etc.

CISSITES PLATANOIDEA n. sp.

(Plate 237. f. 2.)

Leaf symmetrical, 2¾ in. long by 2¾ in. broad, sub-orbicular to fan-shaped in outline, abruptly decurrent at base, obscurely 3-lobed; margin undulate or obscurely dentate; nervation 3-palmate, craspedodrome; midrib abruptly thickened below the point where the lateral primaries branch off, also to a lesser extent below the point where the upper secondaries branch off; secondaries clustered together in two pairs above the middle of the midrib, the upper pair extending to the margins, the lower pair merging gradually into the tertiary nervation, of which it may perhaps be considered to form a part; the latter forming polygonal meshes, well defined; lateral primaries branched mostly from below, obscurely from above near the extremities and abruptly thickened below the point where the first secondaries branch off.

This leaf is suggestive of species which have been described under the genera *Sassafras* (*S. obtusum* Lesq., etc.,) *Platanus* (*P. Heerii* Lesq., *P. obtusiloba* Lesq., etc.), *Cissites* (*C. ingens* Lesq., etc.),

and *Parrotia* (*P. Canfieldi* Lesq.), but is clearly distinct from any of these, and rather than erect a new genus I have decided to class it with *Cissites* and to indicate other characteristics in the specific name.

CISSITES ACUTILOBA n. sp.

(Plate 237. f. 3.)

Leaf 2¾ in. long by 2⅜ in. broad, sub-orbicular in outline, three lobed, lobes acute; nervation 3-palmate; lateral primaries long, almost equalling the midrib, somewhat incurved, margin entire.

Differs from *C. Harkerianus* Lesq., with which it is closely allied, in its more rounded outline, longer lateral primaries and acute lobes and apex.

PROTOPHYLLUM Lesq.

This genus was founded by Lesquereux to include certain leaves of an apparently synthetic type, some of which had been described under the genera *Credneria* and *Pterospermites*. The systematic position of the genus cannot yet be said to be definitely determined, although in Fl. Dak. Gr. *l. c.* it is classed in the Sterculiaceae. Whatever its systematic position may be there is no doubt that our species belongs to the genus as defined.

PROTOPHYLLUM QUERCIFORME n. sp.

(Plate 237, f. 1.)

Leaf 3½ in. long by almost 3½ broad at middle, rhombic-ovate in outline, rounded above, more or less abruptly narrowed from middle to base, slightly acuminate at apex; margin undulate-dentate; nervation craspedodrome; lower secondaries relatively slender, crowded together, branching from the midrib at an obtuse angle; median ones stronger, more distant, branching from the midrib at a more acute angle, forked two-three times; upper ones again slender and branching as before at a more obtuse angle; tertiary nervation uniform, slightly curved outward, simple, fine, and at right angles to the secondaries throughout.

This leaf somewhat resembles *P. Haydenii* Lesq., but differs in its smaller size, narrowed base and more rounded apex. The superficial appearance suggests one of our broad leaved oaks, as I have indicated in the specific name.

In conclusion I wish to acknowledge my indebtedness to Dr. F. H. Knowlton of the United States Geological Survey for criticisms and references in nomenclature and synonomy.

A Preliminary List of the North American Species of Malpighiaceae and Zygophyllaceae.

By Anna Murray Vail.

MALPIGHIACEAE.

1. JANUSIA A. Juss. Monog. Malp. 349. *pl. 21.* 1843.

Janusia gracilis A. Gray, Pl. Wright. 1: 37. 1852.

Distr. Arizona, New Mexico, Texas and Mexico.

2. ASPICARPA Rich. in Mem. Mus. Par. 2: 398. *pl. 1.* 1815.

1. Aspicarpa hyssopifolia A. Gray, Bost. Journ. Nat. Hist. 6: 167. 1850.

Distr. Texas, New Mexico and North Mexico.

2. Aspicarpa longipes A. Gray, Pl. Wright. 1: 37. 1852.

Distr. Texas, New Mexico, southern Arizona and North Mexico.

Very close to *A. humilis* (Benth.), from which it differs mainly in its trailing, and decumbent habit and somewhat larger leaves.*

3. THRYALLIS L. Sp. Pl. Ed. 2, 554. 1763. Not *Thryallis* Mart. Nov. Gen. 3: 77. *pl. 230, 231.* 1829.

Thryallis angustifolia (Benth.) Kuntze, Rev. Gen. Pl. 89. 1891.

Galphimia angustifolia Benth. Bot. Sulph. 9. 1844.

Galphimia linifolia A. Gray, Bost. Journ. Nat. Hist. 6: 166. 1850.

Distr. Western Texas to New Mexico, Lower California and Mexico.

Very variable. The broader leaved form is

Thryallis angustifolia oblongifolia. (A. Gray.)

Galphimia linifolia β oblongifolia A. Gray, Pl. Wright. 1: 36 1852. It is found with the type and may possibly be a species.

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* *Aspicarpa Hartwegiana* A. Juss. Arch. Mus. Par. 3: 598. 1843, is a synonym of *Gaudichaudia humilis* Benth. Pl. Hartw. 6. 1839, *fide* Kew Index.

4. MALPIGIA L. Sp. Pl. 425. 1753.

MALPIGIA GLABRA L. Sp. Pl. 425. 1753.

Malpigia nitida Mill. Gardn. Dict. Ed. 8: No. 5. 1768.

DISTR. Texas, Mexico, West Indies and South America.

5. BYRSONIMA Rich. & Juss. Ann. Mus. Par. **18**: 481. 1811.

BYRSONIMA LUCIDA (Sw.) H. B. K. Nov. Gen. **5**: 147. 1821.

Malphigia lucida Sw. Fl. Ind. Occ. 852. 1800.

DISTR. South Florida and West Indies.

ZYGOPHYLLACEAE.

1. FAGONIA L. Sp. Pl. 386. 1753.

* FAGONIA CALIFORNICA Benth. Bot. Sulph. 10. 1844.

DISTR. California, North and South Mexico.

2. GUAJACUM L. Sp. Pl. 381. 1753.

GUAJACUM SANCTUM L. Sp. Pl. 382. 1753.

Guajacum verticale Ortega, Dec. **8**: 93. 1800.

Guajacum Sanctum var. *parvifolium* Nutt. Sylva, **3**: 17. 1849.

DISTR. South Florida, Bahamas, San Domingo, Porto Rico, etc.

3. PORLIERIA Ruiz & Pav. Prod. 55. *pl. 9.* 1794.

PORLIERIA ANGUSTIFOLIA (Engelm.) A. Gray, Pl. Wright. **1**: 28. 1852.

Guajacum angustifolium Engelm. Wisliz. Rep. 29. 1848.

DISTR. Texas and North Mexico.

4. COVILLEA.†

Larrea Cav. in Ann. Hist. Nat. **2**: 119. *pl. 18, 19.* 1800. Not *Larrea* Orteg. Hort. Matr. Dec. 15. *pl. 2.* 1797.

COVILLEA DIVARICATA (Cav.).

Larrea divaricata Cav. Ann. Hist. Nat. **2**: 122. 1800.

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* FAGONIA CALIFORNICA GLUTINOSA n. var.

Somewhat stouter, the leaflets larger, the terminal one sub-rhomboid, the whole plant beset with sub-sessile, aromatic, gold-colored glands.

Sonora, Mexico, Pringle (1884); Los Angeles Bay, Lower California, Palmer No. 546 (1887); Sta. Rosalia Island, Palmer, Lower California (1890).

The above name appears on a sheet of Mr. Pringle's collection in Herb. Columbia College, and I have not been able to find any printed reference to it.

† Named in honor of Frederick Vernon Coville.

Zygophyllum tridentatum DC. Prodr. 1: 706. 1824.

Larrea Mexicana Moric. Pl. Nouv. Am. 71. *pl. 48.* 1833–1846.

Larrea glutinosa Engelm. Wisliz. Rep. 9. 1848.

DISTR. Southern Utah, Nevada, Arizona, Texas, New Mexico, Mexico and in the deserts of Chili.

Careful examination does not reveal any characters that warrant keeping the Mexican species distinct from the South American. The principal differences were found in the stamineal scale. The latter is a very variable organ, and three or four variations were found, not only on the same plant, but in the same flower.*

5. TRIBULUS L. Sp. Pl. 386. 1753.

1. TRIBULUS CISTOIDES L. Sp. Pl. 387. 1753.

   DISTR. Florida, Texas, Mexico, Lower California, West Indies and tropical America.

2. TRIBULUS TERRESTRIS L. Sp. Pl. 387. 1753.

   DISTR. Ballast Grounds, Hunter's Point, Long Island, N. Y.; South Carolina, Mexico and Brazil. A native of Southern Europe, East Indies, etc.

6. KALLSTROEMIA Scop. Introd. 212. 1777.

1. KALLSTROEMIA CALIFORNICA (S. Wats.)

   Tribulus Californicus S. Wats. Proc. Amer. Acad. 11: 125. 1876.

   DISTR. Arizona, North Mexico and Lower California.

2. KALLSTROEMIA GRANDIFLORA Torrey; A. Gray, Pl. Wright. 1: 28. 1852.

   Kallstroemia grandiflora var. *detonsa* A. Gray, Pl. Wright. 1: 28. 1852.

   Tribulus grandiflorus Benth. & Hook. Gen. Pl. 1: 264. 1862–67.

   DISTR. Texas, Arizona, New Mexico, California, North and South Mexico, Guatemala.

3. KALLSTROEMIA MAXIMA (L.) T. & G. Fl. N. A. 1: 213. 1838.

   Tribulus maximus L. Sp. Pl. 386. 1753.

   Tribulus trijugatus Nutt. Gen. 1: 277. 1818.

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* The other species are *Covillea nitida* (Cav.) and *Covillea cuneifolia* (Cav.), both from South America, and described under *Larrea* in Cav. Icon. 6: 40–41. *pl. 559, 560.* 1801.

Tribulus decolor Macfadyen, Fl. Jamaic. 186. 1837.

DISTR. Kansas, Arizona, Texas, New Mexico, Florida, Mexico, and common in tropical and sub-tropical America to Brazil.

7. PEGANUM L. Sp. Pl. 444. 1753.

PEGANUM MEXICANUM A. Gray, Pl. Wright. 1: 30. 1852. 2: 106. 1853.

DISTR. New Mexico and Mexico.

The Genus Zenobia Don.

In 1834 David Don published "A New Arrangement of the Ericaceae,"* in which he separated a number of species from the large Linnaean genus *Andromeda*, creating at the same time several new genera in which the detached species were included. Of these additions, *Cassandra* (now *Chamaedaphne*), *Cassiope* and *Leucothoe* have long been recognized as distinct; but *Zenobia*, although it was taken up by Bentham and Hooker,† has been considered by Gray and later botanists only a subgenus of *Andromeda*. I here propose to restore it to its original rank, thus preserving the arrangement of Don and of Hooker.

ZENOBIA Don.

Calyx free, 5-lobed; corolla campanulate with 5 rounded lobes; stamens 10, on short basally dilated filaments; anther-cells elongated, 2-awned; stigma simple; capsule depressed-globose, 5-angled, loculicidally 5-valved, many-seeded; seeds oval, with a spongy testa and fleshy albumen. Smooth or glaucous shrubs with somewhat coriaceous strongly reticulated leaves, and white flowers disposed in axillary fascicles.

ZENOBIA CASSINEFOLIA (Vent.).

Andromeda cassinefolia Vent. Hort. Cels. 1: 60. 1800.

Andromeda nitida Sims, Bot. Mag. *pl.* 970. 1803. Not Bartr.

Andromeda speciosa Michx. Fl. Bor. Am. 1: 256. 1803.

Fruticose, glabrous throughout; leaves coriaceous, oblong-ovate, acuminate, irregularly serrate, the earlier obtuse, the later acute, length 5 cm., width 2.5 to 3 cm.: flowers in naked umbelli-

* Edinb. N. Phil. Journ. 17: 158. 1834.

† Genera Plantarum, 2: 587. 1873.

form fascicles; corolla not deeply 5-lobed, 6 to 8 mm. long; calyx spreading, its lobes acutely triangular.

North Carolina to Florida.

ZENOBIA PULVERULENTA (Willd).

Andromeda pulverulenta Willd. Sp. Pl. 2: 610. 1799. Bartr. Trav. N. & S. Car. Georg. *pl. 474.* 1799, without synonymy or description.

Andromeda speciosa var. *pulverulenta* Michx. Fl. Bor. Am. 1: 256. 1803.

Fruticose, glabrous and prominently glaucous throughout; leaves subcoriaceous, elliptical, entire or obscurely serrulate, slightly cuspidate, acute when young, becoming obtuse; length 5.5 to 6 cm., width 2.5 to 3 cm.; calyx somewhat campanulate, its lobes closely appressed to the corolla, and with the peduncle glauco-pulverulent; corolla with lobes more acute than in *cassinefolia.*

Same range as the last, but less common.

This species was figured by Bartram,* who evidently considered it worthy of something more than varietal rank, although he did not describe it. Michaux placed it under his *Andromeda speciosa,* and his example was followed by Pursh,† who remarks in a note on *speciosa*: "I certainly must coincide with Michaux's idea of A. pulverulenta being only a variety, as I very frequently have seen intermediate varieties and even had the trace of both on one plant."

While it is true that *Z. pulverulenta* exhibits a variable degree of glaucosity, there are other characters which, on careful examintion, serve to separate it from *cassinefolia.* The calyx in the one case is campanulate, in the other spreading, with smaller lobes, the leaves are elliptical, and not oblong-ovate; and the peduncles in *pulverulenta* are always prominently glauco-pulverulent, giving the plant a very distinctive appearance. It is also possible that the two species may hybridize, as they occur throughout the same range, and this would explain the various forms which Pursh claims to have seen on the same plant.

CHARLES LOUIS POLLARD.

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* Trav. N. & S. Car. and Georg. l. c.

† Fl. Am. Sept. 2: 294. 1814.

Botanical Notes.

Nomenclatural.—A document has recently been issued from the herbarium of Harvard University, accompanied by a letter signed by the curator of that establishment, objecting to the system of nomenclature adopted almost unanimously by the botanists of the American Association for the Advancement of Science at meetings held in Rochester, N. Y., 1892; Madison, Wis., 1893, and Brooklyn, N. Y., 1894, and recommending certain rules as substitutes. It seems desirable that this document be brought before our botanists for their kindly consideration.

The principles, or it may be better expressed, lack of principles, which are here favored have, as a matter of fact, been most seriously considered by the American Association botanists for more than five years, and every one of them has been carefully weighed and found wanting in its application to a stable system of nomenclature. The proposed rules have, indeed, been framed to support what has recently been fittingly termed the "discredited" plan of nomenclature. Still it may be assumed that they will receive a certain amount of support from plant collectors and physiologists, at least until more books shall have been issued based on the rules which have been proven by long trial in other branches of biological science to give nomenclature the stability which is so necessary. The way for these has been paved by that magnificent work, the "Silva of North America," the most exhaustive and elegant botanical publication yet produced in our country; by several State and local floras; and by other papers too numerous to mention. The want of easily accessible descriptive floras, written on this very practical system approved by the botanists of the American Association, is the only circumstance which retards its still wider adoption. There is every reason to believe that these will soon be supplied.

Proceedings of the Club.

TUESDAY EVENING, APRIL 9TH, 1894.

Vice President Lighthope presided and there were 27 persons present.

The following persons were elected active members: Miss Alice M. Isaacs, Prof. E. S. Burgess, Miss Francis M. Chapin, Mr. John Dallas, Mr. Carl D. Schaeffer, Miss Adelaide Porter, Miss S. LeB. Drumm, Mr. Wm. C. Alpers, Miss Helen Parish, Miss Mabel Choate and Mrs. Hamilton Kean.

Mr. Small, for the committee appointed to draft resolutions upon the death of Mr. Redfield, presented a report and submitted resolutions. The report was accepted and the resolutions adopted. [The resolutions were printed with Mr. Canby's biographical sketch of Mr. Redfield in the April BULLETIN.]

The announced paper of the evening, entitled "*Vallisneria spiralis*," was then read by Miss Effie A. Southworth. The paper consisted of an exhaustive review of the literature of this subject, some contradictory statements by different authors being contrasted, followed by an account of the work which had been done by Miss Southworth looking toward an explanation of such discrepancies, and the contribution of additional facts to our knowledge of this plant.

WEDNESDAY EVENING, APRIL 24TH, 1895.

Vice-President Allen in the chair and 29 persons present.

Mr. John G. Block and Mr. John H. Stottler were elected active members.

Dr. Britton exhibited specimens of last year's growth of *Conopholis Americana*, found by Mr. Stottler on Staten Island, where it was apparently parasitical on an oak. He stated that several hundred plants were growing in this locality, comprising a patch about 10 feet square. Mr. Lighthipe reported two collections of this plant in the vicinity of Woodbridge, N. J., and was able to state that in one of the places there were only a few isolated plants. Dr. Rusby had collected the plant a number of times, but had always

found but a few plants growing in one locality. He had also noticed this peculiarity in the case of *C. Mexicana*. Mr. Van Sickle had found a patch of about 50 specimens growing upon the top of the Palisades.

Dr. Britton called attention the 6th volume of Hough's Wood Sections, which was now ready for distribution and to the publication of Mr. Small's monograph on *Polygonum* and exhibited copies of both.

The announced paper of the evening was then read by Mr. H. A. Siebrecht, entitled "Some Interesting Orchids of Cultivation." The paper was handsomely illustrated with living specimens in bloom. The paper dealt with the history of the earliest collections and collectors of orchids, and traced the development of their cultivation up to the present time. Interesting facts concerning their native habits and the best methods of growing the different classes were presented, and a discussion concerning their special habits of growth and fertilization was introduced.

Index to recent Literature relating to American Botany.

Atkinson, G. F. Additional Note on the Fungi of Blowing Rock, N. C. Journ. Elisha Mitchell Sci. Soc. **10**: 78. 1894.

Atkinson, G. F. Additions to the Erysipheae of Alabama. Journ. Elisha Mitchell Sci. Soc. **10**: 74–76. 1894.

Atkinson, G. F. Comparative Study of the Structure and Function of the Sporangia of Ferns in the Dispersion of Spores. Proc. A. A. A. S. **42**: 253, 254. 1894.

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Atkinson, G. F. Preliminary Note on the Relation between the sterile and fertile Leaves of *Onoclea*. Bot. Gaz. **19**: 374, 375. 1894.

Atkinson, G. F. Preliminary Note on the Swarm-spores of *Pythium* and *Ceratiomyxa*. Bot. Gaz. **19**: 375–378. 1894.

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Atkinson, G. F. Symbiosis in the Roots of the Ophioglosseae. Proc. A. A. A. S. **42**: 254, 255. 1894.

Atkinson, G. F. The Study of the Biology of Ferns by the Collodian Method. 8vo. pp. 134. *f. 163.* London and N. Y., McMillan & Co. 1894.

Bailey, L. H. The Recent Apple Failures. Bull. N. Y. (Cornell) Exp. Sta. 84: pp. 34. *f. 9. pl. 1.* Ja. 1895.
Treats largely of apple scab, with colored plate.

Bailey, W. W. George Hunt. Bot. Gaz. **20**: 176, 177. 20 Ap. 1895.

Bastin, E. S. Structure of *Epigaea repens*. Am. Journ. Pharm. **67**: 231–236. *f. 1–3.* My. 1895.

Bolley, H. L. Distribution of Weed Seeds by Winter Winds. Bull. N. Dak. Exp. Sta. 17: 102–105. Mr. 1895.

Bolley, H. L. Effect of Seed Exchange upon Culture of Wheat. Bull. N. Dak. Exp. Sta. 17: 85–102. Mr. 1895.

Blodgett, F. H. On the Development of the Bulb of the Adder's-tongue. Bot. Gaz. **20**: 172–175. *pl. 14.* 20 Ap. 1895.

Boyer, C. S. A fossil marine Diatomaceous Deposit at St. Augustine, Florida. Bull. Torr. Bot. Club, **22**: 171–174. 18 Ap. 1895.

Britton, N. L. The Systematic Botany of North America. Bot. Gaz. **20**: 177–179. 20 Ap. 1895.
Announcement of assignments of groups to monographers.

Canby, W. M. John H. Redfield. Bull. Torr. Bot. Club, **22**: 162–171. 18 Ap. 1895.
Sketch of life, with bibliography and portrait.

Chodat, R. Polygalaceae novae vel parum cognitae. Bull. Herb. Boiss. **3**: 121–135. Mr. 1895.
Five new species of *Polygala* and fourteen of *Monnina* from Central and South America are described.

Coville, F. V. A Reply to Dr. Robinson's Criticism of the "List of Pteridophyta and Spermatophyta of Northeastern America." Bot. Gaz. **20**: 162–167. 20 Ap. 1895.

Coville, F. V. Report of the Botanist U. S. Department of Agriculture for 1893. Rep. Sec. Agric. **1893**: 235–244. 1894.

Deane, W. Notes from my Herbarium. II. Bot. Gaz. **20**: 150–154. 20 Ap. 1895.

Eastwood, A. Two Species of *Aquilegia* from the Upper Sonoran Zone of Colorado and Utah. Proc. Cal. Acad. Sci. II. **4**: 559–562. *pl. 18, 19.* 19 Mr. 1895.
Aquilegia micrantha n. sp. and *A. ecalcarata* Eastwood are illustrated and described.

Forbes, S. A. Experiments with the Muscardine Disease of the Chinch Bug, etc. Bull. Ill. Exp. Sta. 38: 25–86. *pl. 8.* Mr. 1895.

Sporotrichum was cultivated upon chinch bugs, and also equally as successfully upon a mixture of cornmeal and beef broth.

Gardner, F. D. Corn Experiments. Bull. Ill. Exp. Sta. 37: pp. 24. F. 1895.

Cross-fertilization—Effect of removing tassals.

Greene, E. L. Novitates occidentales.—XII. Erythea. 3: 62–68. 1 Ap. 1895.

New species in *Floerkea, Calyptridium, Rumex, Spiraea, Eryngium, Sanicula, Erigeron, Cladothamnus, Phacelia, Cryptanthe, Mimulus, Fritillaria.*

Greene, E. L. Phytographic Notes and Amendments.—I. Erythea, 3: 53–57. 1 Ap. 1895.

Hennings, P. Fungi Goyazenses. Hedwigia, 34: 88–112. 8 Ap. 1895.

Describes Fungi collected by Dr. E. Ule in Brazil. New species in *Ustilago, Uromyces, Puccinia, Cronartium, Ravenelia, Uredo, Aecidium, Asterina, Asterula, Asteroma, Dimerosporium, Parodiella, Meliola, Hypocrella, Uleomyces* (n. g.), *Ophioceras, Trabutia, Xylaria, Phyllachora, Dothidella* and *Tryblidium.*

Keffer, C. A. The Banksian Pine in the Nebraska Sand Hills. Gard. & For. 8: 152. 1 My. 1895.

Kellerman, W. A. and **Werner, W. C.** Catalogue of Ohio Plants. Geology of Ohio, 7: 56–406. 1895.

A list of plants of the state, citing distribution and known localities for the rarer species, prefaced by a bibliography.

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Gives bibliography, manner which the fungus enters the host, and method of successful treatment.

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Deals largely with fungous diseases, with figures and treatment.

Macoun, J. M. Contributions to Canadian Botany.—III. Can. Rec. Sci. **6**: 198–210. 1895. [Contr. Herb. Geol. Surv. Canada, III.]
Record of numerous new localities and of several species additional to the Canadian flora.

Meehan, T. *Baptisia tinctoria.* Meehan's Month. **5**: 81, 82. *pl. 5.* My. 1895.

Meehan. T. John H. Redfield. Bot. Gaz. **20**: 175, 176. 20 Ap. 1895.

Möller, A. Brasilische Pilzblumen. Bot. Mitth. aus den Tropen, **7**: pp. 152. *pl. 8.* 1895.
Description and illustration of fungi in the genera *Protubera, Clathrus, Colus, Laternea, Blumenavia, Aporophallus, Mutinus, Itajahya, Ithyphallus* and *Dictyophora.*

Nash, G. V. Notes on some Florida Plants. Bull. Torr. Bot. Club, **22**: 141–161. 18 Ap. 1895.
New species in *Helianthemum, Stipulicida, Rhynchosia, Rhexia, Hieracium, Asclepias, Breweria, Persea, Crotonopsis, Nolina, Xyris, Commelina* and *Stenophyllus.*

Oliver, D. *Tricholaena Monachyron.* Hook. Icon. Pl. **24**: *pl. 2374.* Ap. 1895.
A native of Cape Verde Islands introduced on St. Vincent.

Pammel, L. H. Potato Scab and its Preventive. Bull. Iowa Exp. Sta. **27**: 120–130. *f. 3.* 1895.

Pammel, L. H. The Development of Fungi. Gard. & For. **7**: 248, 249. 1894.
Brief notes on *Exoascus deformans* and *Monilia fructigena.*

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Parish, S. B. Further Additions to the Flora of Southern California. Erythea, **3**: 58–62. 1 Ap. 1895.

Robertson, C. Flowers and Insects.—XIV. Bot. Gaz. **20**: 139–149. 20 Ap. 1895.

Schmidle, W. Einige Algen aus Denver, Colorado. Hedwigia, **34**: 84, 85. *fig.* 8 Ap. 1895.
Describes *Cosmarium mesochondrion* new.

Schneck, J. Observations on the Spider-flower. Bot. Gaz. **20**: 168–170. *fig.* 20 Ap. 1895.
Notes on *Cleome spinosa.*

Shull, G. H. Observations on *Enslenia albida.* Bot. Gaz. **20**: 170–172. *pl. 13.* 20 Ap. 1895.

Contributions from the Herbarium of Columbia College.

[The numbers omitted from this list are out of print.]

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... 25 cents.

No. 5. New or Noteworthy North American Phanerogams. By N. L. Britton (1888), ... 25 cents.

No. 6. An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1886–1887. By N. L. Britton. (Twenty-three parts published; not yet completed.)

No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . 25 cents.

No. 9. A List of Plants Collected by Dr. E. A. Mearns at Fort Verde and in the Mogollon and San Francisco Mountains, Arizona, 1884–1888. By N. L. Britton.

The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), ... 25 cents.

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No. 16. New or Noteworthy North American Phanerogams, III. By N. L. Britton (1890), ... 25 cents.

No. 17. The Flora of the Desert of Atacama. By Thos. Morong (1891), . 25 cents.

No. 20. New or Noteworthy North American Phanerogams, IV. By N. L. Britton. (1891), ... 25 cents.

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No. 24. Review of the North American Species of the Genus *Xyris*. By Heinrich Ries (1892), ... 25 cents.

No. 25. A Preliminary List of the Species of the Genus *Meibomia* occurring in the United States and British America. By Anna M. Vail (1892), . 25 cents.

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No. 29. New or Noteworthy North American Phanerogams, VI. By N. L. Britton (1892), ... 25 cents.

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No. 34. The N. American Species of *Lespedeza*. By N. L. Britton (1893), 25 cents.

No. 35. An Enumeration of the Plants Collected by Dr. Thos. Morong in Paraguay, 1888–1890. By Thomas Morong and N. L. Britton, with the assistance of Miss Anna Murray Vail (1892–1893), ... $1.50

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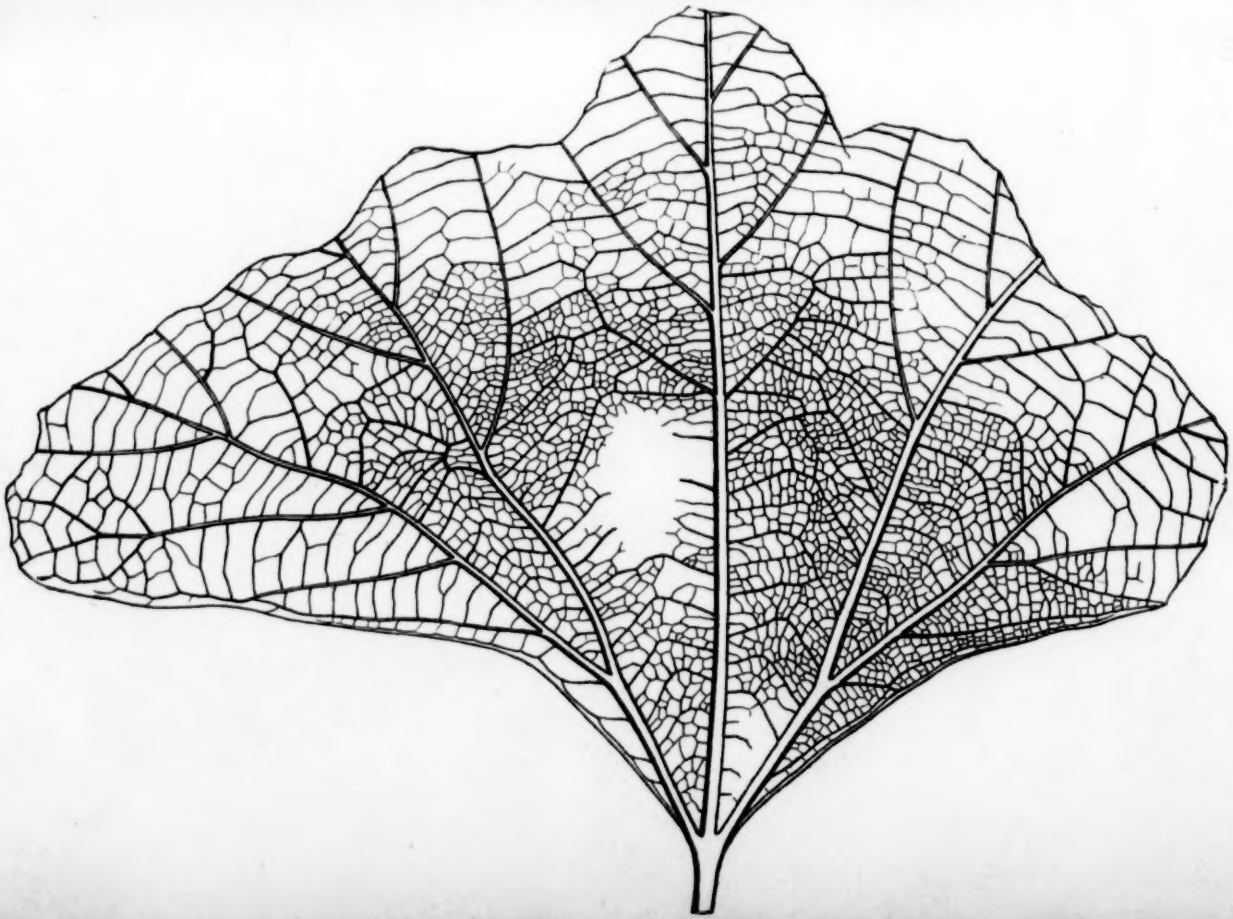

SASSAFRAS DISSECTUM SYMMETRICUM HOLLICK.

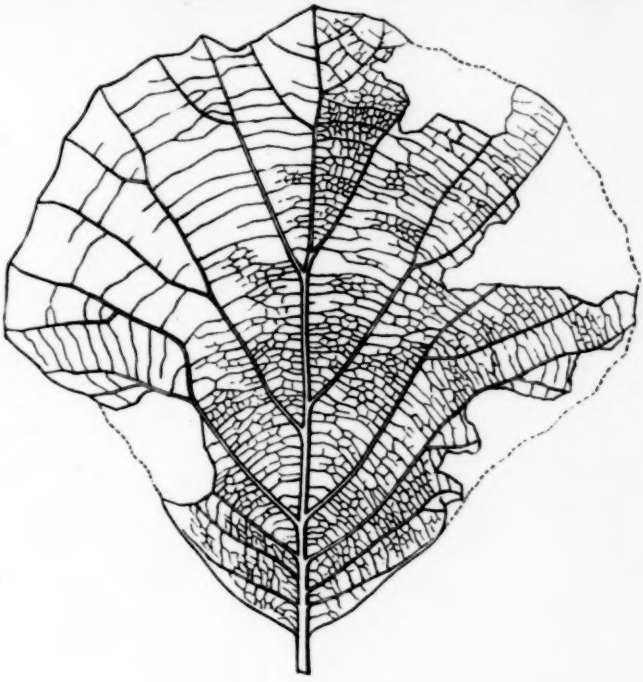

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FIG. 1. PROTOPHYLLUM QUERCIFORME HOLLICK.
FIG. 2. CISSITES PLATANOIDEA HOLLICK.
FIG. 3. CISSITES ACUTILOBA HOLLICK.

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